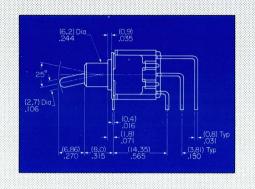
Design Guide For The '90s



# nkk<sup>®</sup> switches

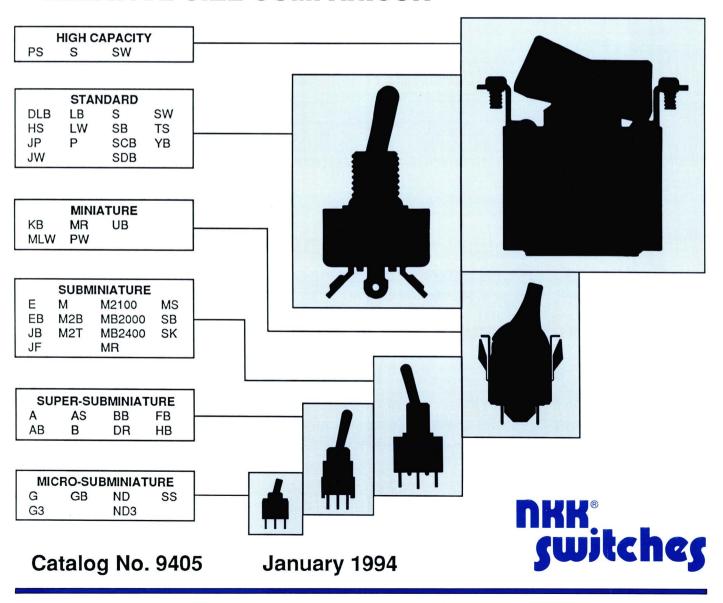
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# DESIGN GUIDE

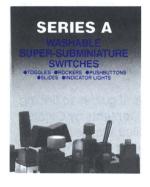


Reliable, innovative designs begin with this reference source. Inside, well over a million options are presented. A unique "Switch Builder" guide at the beginning of each section, allows the engineer to quickly identify the exact switch circuit, terminations, actuator, etc. needed to complete a design. Thousands of precision dimensional drawings permit cut and paste design-ins. Backed by over 40 years of excellence, NKK is dedicated to providing the finest switch products and service available. For additional information or assistance with custom designs, call NKK for fast courteous service: 1-602-991-0942.

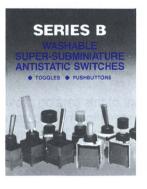
#### RELATIVE SIZE COMPARISON



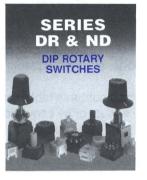
## **CONTENTS BY PRODUCT SEQUENCE**



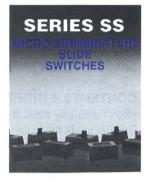
Pages A1 - A22



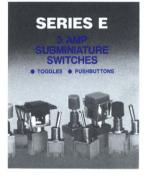
Pages B1 - B12



Pages C1 - C14



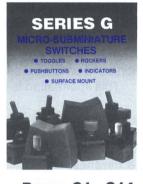
Pages C15 - C20



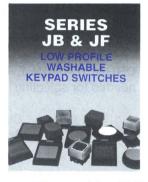
Pages E1 - E16



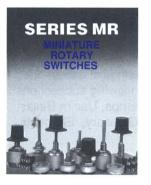
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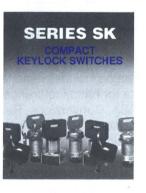
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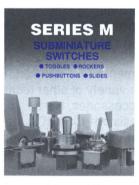
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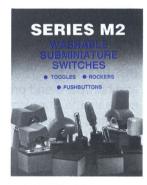
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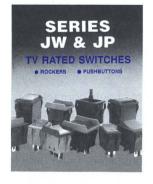
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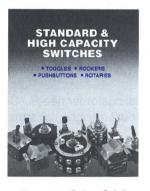
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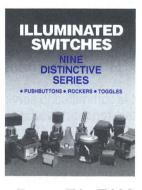
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#### **ABOUT THIS DESIGN GUIDE**

This engineering guide, like its predecessor Big Cat. 3rd edition, considers the user's need for complete, precise technical information along with handy ordering and reference details. Within the 440 pages of this Big Cat. are all the materials familiar to users of the previous Big Cat. and of the Standard and High Capacity Brochure, plus data on the most current product developments. Various refinements update the previous catalog with additions of new product options, augmented technical data and drawings, as well as improved layouts.

**CONTENTS & INDEXES** Three contents tables at the front of this catalog provide general guides to finding information by switch type, by series, or by sequence of presentation in the catalog. The Contents by Catalog Sequence is also placed at the end of the catalog on the last page of the Supplement. Detailed access by model numbers, ratings, sizes, mounting styles, terminals, and washability is found in the Switch Index by Model Number and in the Switch Selection Guide which follow the contents pages.

**PAGING** The sequence of the catalog sections is largely alphabetical by series. For example, Section A contains the A Series toggles, rockers, pushbuttons, slides, and indicators; and Section A is numbered A1 through A24. Section M contains the M Series toggle, rocker, pushbutton, and slide switches with pages numbered M1 through M90. Not all section letters correspond to the series letters. For instance, Section K contains the MR Series rotaries on pages K1 through K10. All categories of illuminated devices appear in the last product section, pages T1 through T112.

**ORGANIZATION** Every section has a consistent sequence of information to give the user every technical detail needed for selecting a device. This information is organized into the following categories:

Distinctive Features
Applications
General Specifications
Materials & Finishes
Details of Special Features

Typical Ordering Example
Explanation of Codes & Options
Accessories
Mounting Information
Dimension Drawings

**ORDERING** All the information necessary to make a complete part number is given on a single page in each typical ordering example. The ordering explanation is a simple, concise presentation of part number codes and their definitions. These definitions give an overview of the more detailed information found on the pages following each typical ordering example.

**SUPPLEMENT** The Supplement found at the end of the catalog includes dimension drawings of accessories and hardware and provides a variety of other technical data for handy reference. The following subsections make up the Supplement: Accessories, Hardware, UL & CSA, Conversions, Rerating Lamps, Use of Ballast Resistor, Recommended Resistors for LEDs, Lamp Specifications, Electrical Data, Glossary, Elements, Federal Supply Code Number, and Illustrated Index by Catalog Sequence.

**CUT & PASTE DRAWINGS** The dimension drawings have been developed with the user's convenience in mind. The customer can literally photocopy, cut, and paste a "do it yourself" drawing on his own company drawing format. Complete dimension drawings can be pieced together using all the drawings of actuators, bushings, and other variable parts which are sized to match the mechanical drawings at the end of each section. To complete the dimension drawings, the general specifications and pole and circuit charts can be added.

**METRIC & INCH** All drawings in this catalog have been dimensioned in English and metric units for the customer's convenience. The metric units are given in parentheses above the inch units. In some instances, the values have been rounded to the nearest thousandth for simplicity in displaying the dimension.

**CUSTOM PRODUCTS** NKK is committed to serving special customer needs. Customers should contact the factory or an area representative regarding variations in product designs, for samples, or for special drawings.

**WARRANTY** All NKK products are warranted against defects in workmanship, material and construction for a period of one (1) year from the date of shipment if the products have been properly installed, used, and maintained. There are no express warranties or warranties of merchantability or fitness for a particular purpose. Materials, finishes, and component parts are subject to change without notification.

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# **CONTENTS BY SERIES**

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		.00 100		agines i lonolide rollolling de olide-ili	100 44

# **SWITCH SELECTION GUIDE**

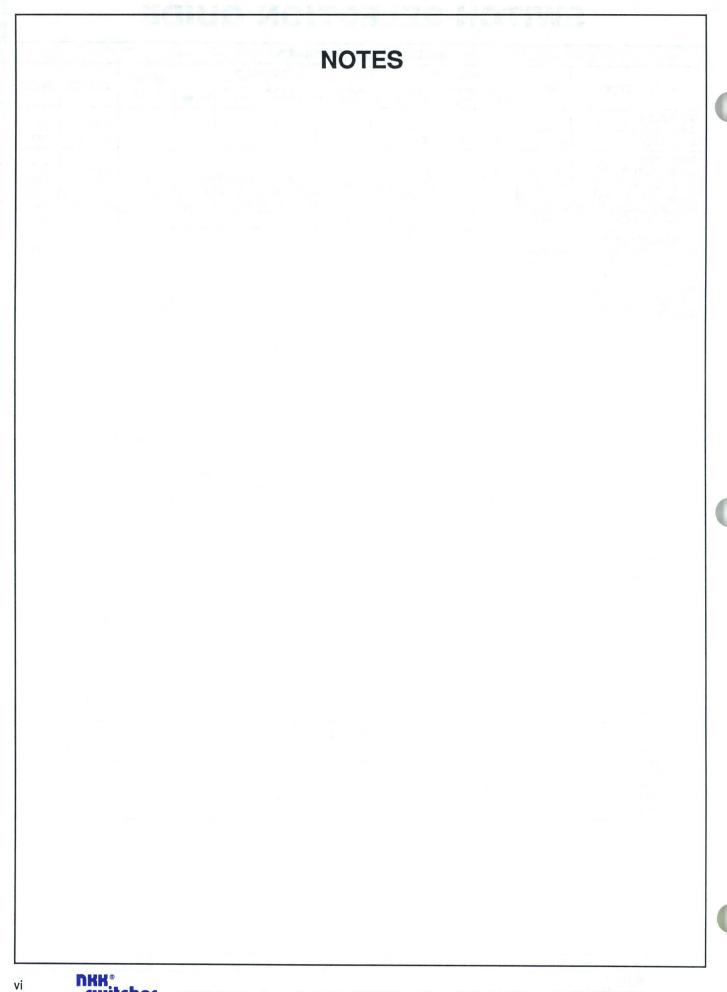
				NO	MILL	IMU.	IATED	SWI	TCHES					
XTA-	1 4			MOUN		88 E.	1		TERMIN			WASH-		
MAX RATING	5	SIZE	PC Board	Bush- ing	Snap-	Two	Solde	PC	Quick Connec	Wire- t Wrap	Screw	ABLE	SERIES	PAGE
TOGGLES	- 14.7		7									1110		
0.4VA @ 28V AC/DC	400000	rosub	X			198		X		1		X	G	G1
0.4VA @ 28V AC/DC		ersub		quare B				X				X	A	A1
0.4VA @ 28V AC/DC		ersub		ound A	nustauc	Busn	)) X	X				Х	B M	B1 M1
0.4VA@28V AC/DC 0.4VA@28V AC/DC		min min	X	^			^	X	Х	X		Х	M2T	N1
3A @ 125V AC	00000000 00000000	min	Ŷ	Х			Х	x		^		^	E .	E1
6A @ 125V AC		min	X	X			x	X	Х	X	************		м	M1
6A @ 125V AC		min	X	~		5 H S	^	X		X		X	M2T	N1
10A @ 125V AC	star	ndard	X	X			X	X	X				Р	S4
25A @ 125V AC	star	ndard		X			X		X		Χ		S Std	S7
30A @ 125V AC	std/	hi cap		X							Х		S Hi Cap	S16
30A @ 125V AC/DC	std/	hi cap		Х							Χ		S AC/DC	\$16
ROCKERS				••••										
0.4VA @ 28V AC/DC	míc	duaon	X					×				X	G	G1
0.4VA @ 28V AC/D		ersub	X					X				X	Α	A1
0.4VA @ 28V AC/DC	sub	min	X		Х	Х	X	X	X	Х			M	M23
0.4VA @ 28V AC/DC		min	Х					X		X		X	M2T	N1
5A @ 125V AC	min	niature			X		X						PW	M39
6A @ 125V AC	sub	min	Х		X	X	X	X	X	X			М	M23
6A @ 125V AC	sub	min	X					×				X	M2T	N1
10A @ 125V AC	star	ndard				X	X	X	X				P	S4
10A @ 125/250V AC	sta	ndard			Х		X		X				JWM	P1
16A @ 125/250V AC	sta	ndard			X		X		X				JWL	P1
20A @ 125V AC	sta	ndard				X	X						SW Std	S20
30A @ 125V AC	std	/hi cap				X					X		SW Hi Cap	S22
30A @ 125V AC/DC	std	/hi cap				X					X		SW AC/DC	S22
PUSHBUTTONS														
0.4VA @ 28V AC/DC	mic	rosub	X					X				×	GB	G6
0.4VA @ 28V AC/DC		ersub		quare E	ushina	1		X				X	AB	A15
0.4VA @ 28V AC/DC		ersub		ound A			2)	X				X	BB	B9
0.4VA @ 28V AC/DC		ersub	X,	Χ			" x	X					FB	F6
0.4VA @ 28V AC/DC		min	Х					X				X	M2B	N12
0.4VA @ 28V AC/DC	sut	min	Х	X	Х		X	X	X	X			MB2000	M51
0.4VA @ 28V AC/DC		omin	Х	Х	X		Х	X		Х	1		MB2400	M69
500mA @ 125V AC	sup	ersub	X	X			X	X					FB	F6
1A @ 125V AC	sub	omin	X					X				X	M2B	N13
3A @ 125V AC	sut	omin	X	Х	X		X	X					EB	E8
3A @ 125V AC	sut	omin	X	X	Х		X	X					MB2400	M69
3A @ 125V AC	sut	omin		X			X X X						SB4011	F1
6A @ 125V AC	sub	omin	X	X	X		X	X	X	X			MB2000	M51
10A @ 125/250V AC		ndard			X		X		X				JPM	P1
15A @ 125V AC	sta	ndard		X			X		X		X		SCB	S29
15A @ 125V AC	sta	ndard			X	×	X						SDB	S27
16A @ 125/250V AC	sta	ndarđ			Х		X		X				JPL	P1
SLIDES					T		T				1			
0.4VA @ 28V AC/DC		persub	X					X					AS	A19
0.4VA @ 28V AC/DC		omin	X			X	X	X					MS	M83
0.1A @ 30V DC	mic	crosub	X					X					SS	C15
6A @ 125V AC	sub	omin	X			X	X	X					MS	M83
					SURI	FACE	MOUN	T DE	VICES					
					ACTI	JATOF	2		1	SMD				
MAX RATING		SIZE		_	AUTO	DATO	1		-	SIVID		WASH-	SERIES	PAGE
max name	`		Toggle	Push	b'tn S	Slide I	Rocker	Rotary	Butt G	ull Wing	J-Bend	ABLE	OLITICS	FAGE
0.41/4.62.001/.40/D0									/				00	
0.4VA @ 28V AC/DC 100mA @ 5/50V DC		crosub	X	×	`			Х		X		X	G3 ND3	G9 C11
100111A @ 3/30 V DO	Time	210300				KI	YPAD			^		^	INDS	011
MAX RATING	SIZE	MO	UNTIN	G T	OPFR		FORC	_		ILLUMIN	MOITAL		SERIES	PAGE
	ubmin		Board					_						
	I HIIIUuu	P(				180 gra		1 -				llumination	JB	J1
	uhmin I	D/	Baced	1		100	me		Cook III.	ninctio-	w Marille	mination	100	1 10
50mA @ 24V DC	submin submin		Board Board			180 gra 270 gra			Spot Illur			mination Ilumination	JF JB	J8 J1

# **SWITCH SELECTION GUIDE**

				ILLU	MINAT	TED SW	/ITC	HES					
			MOUN	ITING				TERMINA	LS		WASH-		
MAX RATING	SIZE	PC Board	Bush- ing	Snap- in	Two Screw	Solder Lug	PC	Quick Connect	Wire- Wrap	Screw	ABLE	SERIES	PAGE
TOGGLES 0.4VA @ 28V AC/DC 6A @ 125V AC	submin submin	X	X	X	X	X	X	X				M2100 M2100	T97 T97
ROCKERS 0.4VA @ 28V AC/DC	submin	x	x	Х	х	х	Х	х				M2100	T97
5A @ 125V AC 6A @ 125V AC 10A @ 125V AC 20A @ 125V AC	miniature submin standard std/hi cap	х	Х	X X X	X	X X X	х	χ				MLW M2100 LW LW	T79 T97 T89 T95
PUSHBUTTONS 0.4VA @ 28V AC/DC 0.4VA @ 28V AC/DC 0.4VA @ 28V AC/DC	miniature standard standard	X X X	X X X	X X X		X X X	X X X	x				KB DLB LB	T19 T71 T51
0.4VA @ 28V AC/DC 0.4VA @ 28V AC/DC 0.1A @ 30V AC	miniature standard supersub	X	X X	X		X X X	X	х				UB YB HB	T13 T35 T3
1A @ 125V AC 3A @ 125/250V AC 3A @ 125/250V AC	miniature standard standard	X	X X X	X X X		X X X	X	X				KB LB YB	T19 T51 T35
5A @ 125V AC 5A @ 125/250V AC	miniature	Ŷ	^	X		x	Ŷ					UB	T13
SLIDES 0.4VA @ 28V AC/DC 0.1A @ 30V DC 6A @ 125V AC	submin microsub submin	×××			×	x x	X X					MS SS MS	M89 C15 M89
					BO.	TARIES							

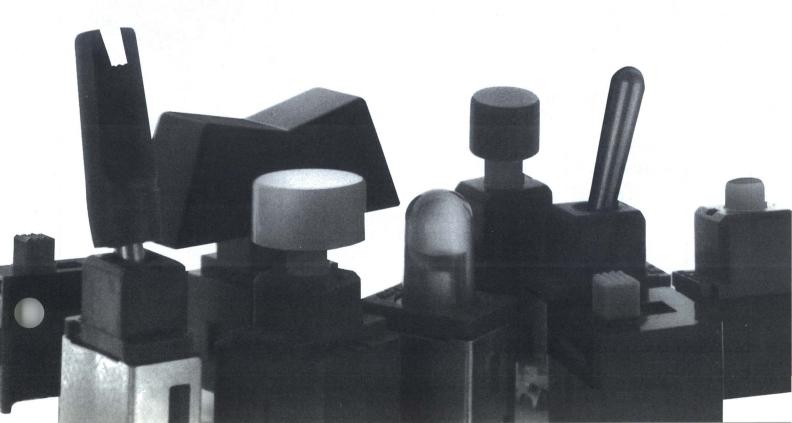
		MOUI	NTING	INDEXING	TER	MINAL	S	WASH-		
MAX RATING	SIZE	PC Board	Bushing	(Step Size)	Solder Lug	PC	Screw	ABLE	SERIES	PAGE
0.4VA @ 28V AC/DC	miniature	Х		30°		X		X	MRF	K1
0.4VA @ 28V AC/DC	miniature	X	X	30°		X		X	MRK	K1
100mA @ 5V DC	supersub	Х		30° & 36°		X		X	DR	C1
100mA @ 5/50V DC	micrasub	Χ		30° & 36°		Χ		Х	ND	C7
250mA @ 125V AC	miniature	Χ	X	30°		Х		X	MRA	K1
250mA @ 48V DC	miniature	Х	X	30°		Х		Х	MRA	K1
1A @ 30V DC	miniature	N. 1 - 1 ( 13 ) ( 15 - 15 - 15 - 15 - 15 - 15 - 15 - 15	X	45°	Turret				MRX	K8
2A @ 125V AC	miniature		X	45°	Turret				MRX	K8
2A @ 30V DC	miniature		X	60°	Turret				MRY	K8
3A @ 125V AC	miniature		X	60°	Turret				MRY	K8
4A @ 30V DC	miniature		X	120°	Х				MRT	K8
6A @ 125/250V AC	submin		X	30°			Х		TS	535
10A @ 125V AC	miniature		X	120°	Х				MRT	K8
12A @ 125V AC	supersub		X	45°			X		HS13	S33
12A @ 125V AC	supersub		X	30°			X		HS16	S32
30A @ 125/250V AC	std/hi cap		Х	30°			Х		PS	534

			KEYL	.ocks				
MAX RATING	SIZE	MOUNTING	INDEXING	TERMINALS	POSITIONS	WASHABLE	SERIES	PAGE
0.4VA @ 28V AC/DC	submin	PC Board	45°	PC	3	X	SK	L8
0.4VA @ 28V AC/DC	submin	PC Board	90°	PC	2	X	SK	L8
3A @ 125V AC	submin	Bushing	45°	Solder Lug	3		SK	L1
3A @ 125V AC	submin	Bushing	90°	Solder Lug	2		SK	L1



# SERIES A WASHABLE SUPER-SUBMINIATURE SWITCHES

OTOGGLES OROCKERS OPUSHBUTTONS OSLIDES OINDICATOR LIGHTS



# NKK® SERIES A

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE

#### **DISTINCTIVE FEATURES**



Super-subminiature size (1/3 size of Series M switches) saves space on PC boards.

Totally sealed body prevents contact contamination, allows time- and money-saving automated wave soldering and washing.

Patented Sliding Twin Crossbar (STC) mechanism provides unequalled logic-level reliability and smoother, positive detent actuation.

Molded-in, epoxy sealed terminals lock out flux, solvents, and other contaminants.

# Actual Size

.100" x .100" terminal spacing conforms to standard PC board grid spacing.

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABL

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

0.4VA maximum @ 28V AC/DC maximum

(Resistive Load)

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

50 milliohms maximum

Insulation Resistance:

500 megohms minimum @ 500V DC

Dielectric Strength:

500V AC minimum

Mechanical Life:

Toggles & Rockers:

100,000 operations minimum for ON-NONE-ON & ON-OFF-ON

50,000 operations minimum for other circuits Pushbuttons: 50,000 operations minimum

**Electrical Life:** 

50,000 operations minimum

**Ambient Temp Range:** 

-10°C through +85°C (+14°F through +185°F)

Optional low temperature lubricant available

Toggle Angle of Throw:

26°

**Rocker Angle of Throw:** 

26°

**Pushbutton Travel: Nominal Operating Force:**  Pretravel 0.7mm (.028") Overtravel 0.4mm (.016") Total 1.1mm (.043") Toggles A & E & K w/Long Paddle: 150g (momentary); 120g (maintained)

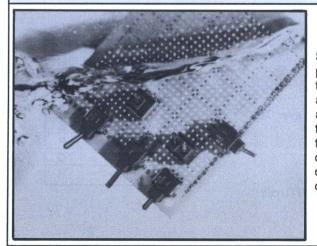
Toggles J & H & K w/Short Paddle: 278g (momentary); 188g (maintained)

Rockers w/Actuators K & K1: 253g (momentary); 206g (maintained)

Pushbuttons: 260a

MATERIALS & FINISHES				
Toggle/Rocker Actuator	Nickel plated brass			
Pushbutton Plunger	Polyacetal			
Case Housing	Glass fiber reinforced polyamide			
Support Bracket	Tin plated phosphor bronze			
Movable Contact	Phosphor bronze with gold plating over silver plating			
Stationary Contacts	Brass with gold plating over nickel undercoating			

#### STC CONTACT MECHANISM

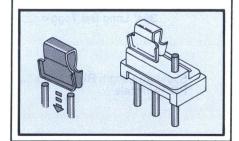


Sealed body construction permits Series A switches to be subjected to timeand money-saving automated soldering techniques. As a result, they can be safely cleaned of flux without fear of compromising operating characteristics.

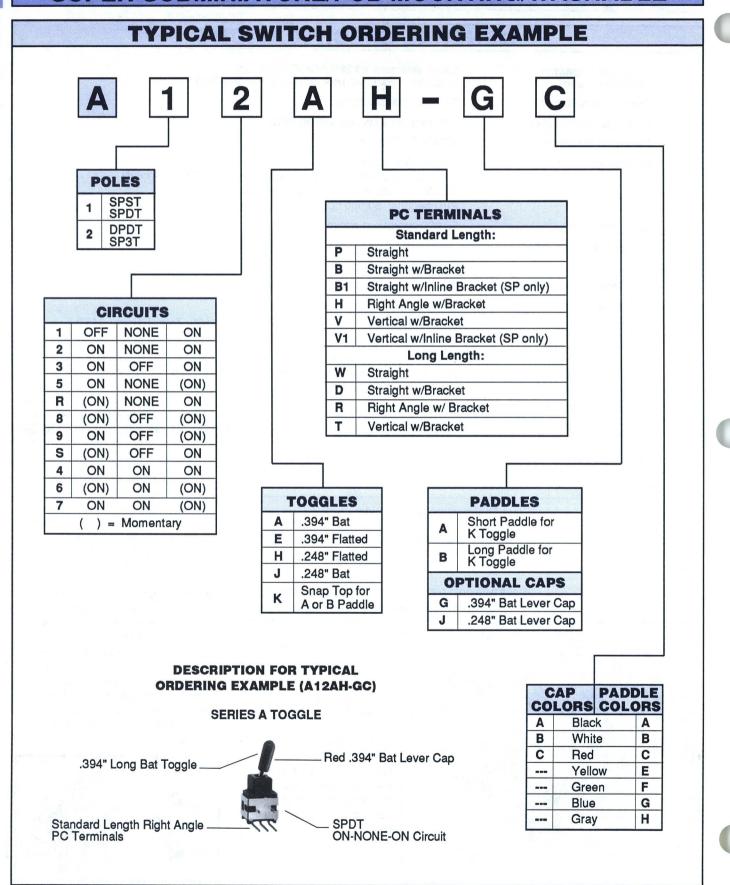
#### STC CONTACT MECHANISM

NKK's patented, award-winning STC contact mechanism offers benefits unavailable in conventional mechanisms. For example, movable twin contact surfaces pinch the stationary contacts to provide increased contact stability and unparalleled logic-level reliability.

Continued reliability is assured since the gold-plated contacts are wiped clean with each actuation. Furthermore, if one side of the twin contacts should fail to conduct, the other side functions as a backup, or fail-safe path for the current. The combination of rounded movable and stationary contacts provides smooth contact feel previously unavailable in sliding contact type mechanisms.



#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE



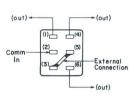
	PC	LES AND C	RCUITS		
		TOGGLE POS	TION & TERMIN	IAL NUMBERS	
		Up	Center	Down	
POLE & THROW	MODEL	Slot			
SPST	A11	OFF	NONE	ON	
CONNEC TERMIN		OPEN	OPEN	3-1	
SCHEM	IATIC		INTERNAL CONNECTION	p .	
SPDT	A12 A13 A15 A1R A18 A19 A1S	ON ON (ON) ON (ON) (ON)	NONE OFF NONE NONE OFF OFF	ON ON (ON) ON (ON) (ON)	
CONNEC		2-3	OPEN	2-1	
SCHEM	IATIC		2 (COMM)		
DPDT	A22 A23 A25 A2R A28 A29 A2S	ON ON ON (ON) (ON) ON (ON)	NONE OFF NONE NONE OFF OFF	ON ON (ON) ON (ON) (ON)	
CONNEC TERMIN		2-3 5-6	OPEN	2-1 5-4	
SCHEM	IATIC		2 (COMM) 59	5	
SP3T	A24 A26 A27	ON (ON) ON	ON ON ON	ON (ON) (ON)	
CONNECTERMINE W/O EXT	ALS FRA	2-3 5-6	2-3 5-4	2-1 5-4	
SCHEM W/EXTI CONNE	the distribution	External Connection , 2 (in) 5 (out) 3 4 (out) 6 (out)	External Connection > 2(in) 5 5 (igut) 3 4(out) 6(out)	Esternal Connection .  2 (in) 5  (lout) 3 4 (out) 6 (out)	
Terminal n	umbers not a	tually on switch. 3-0	DNs are shorting; o	thers nonshorting.	

#### **THREE-ON POSITIONS**

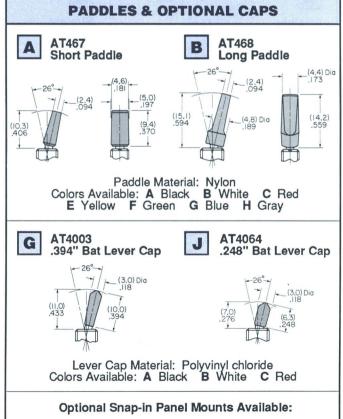
In the manufacture of the A24, A26, and A27 models, a double pole double throw switch is converted to a single pole with 3 independent circuits. The extra connection shown in the diagram must be made during field installation.

Note that terminal numbers are not actually indicated on the switch.

These 3-on models have shorting contacts.

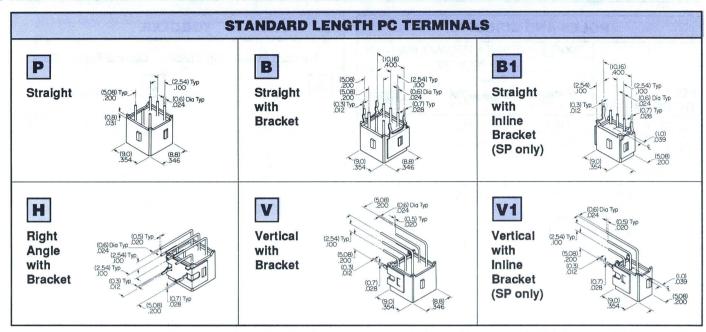


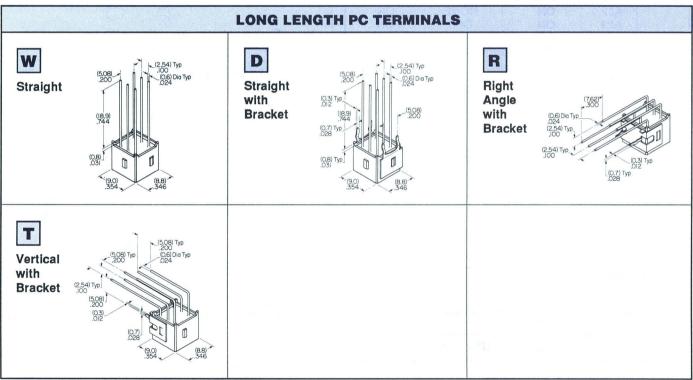
# **TOGGLES** Standard Finish: Bright Nickel Optional Finish: Black .394" Bat .394" Flatted (2.6) Dia H .248" Flatted .248" Bat (2.6) Dia Snap Top for Paddles Note: Rocker actuators are shown in the rocker section.



AT530 for Single Pole AT531 for Single or Double Pole See Accessories section in the Supplement at the end of this catalog.

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE





#### **PCB MOUNTING**

The use of a support bracket or placement of the square bushing in a panel cutout is recommended to increase PCB mounting stability.

Alcohol cleaning solvents are recommended.

#### **SOLDERING SPECIFICATIONS**

Recommended Time and Temperature Limits:

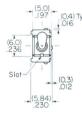
3 seconds at 350°C or

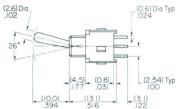
5 seconds at 270°C.

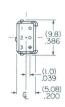
#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE











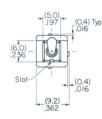


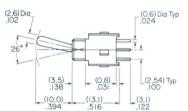
A12AP Model Shown

A11 models do not have terminal 2.

#### P Straight Terminals without Bracket/Double Pole







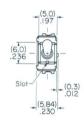


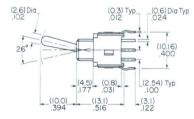


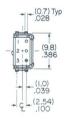
**A22AP Model Shown** 

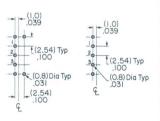
#### B Straight Terminals with Bracket/Single Pole











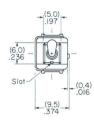
A12AB Model Shown

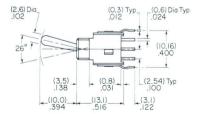
**B** Terminals

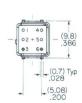
**B1** Terminals

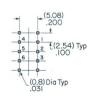
#### B Straight Terminals with Bracket/Double Pole





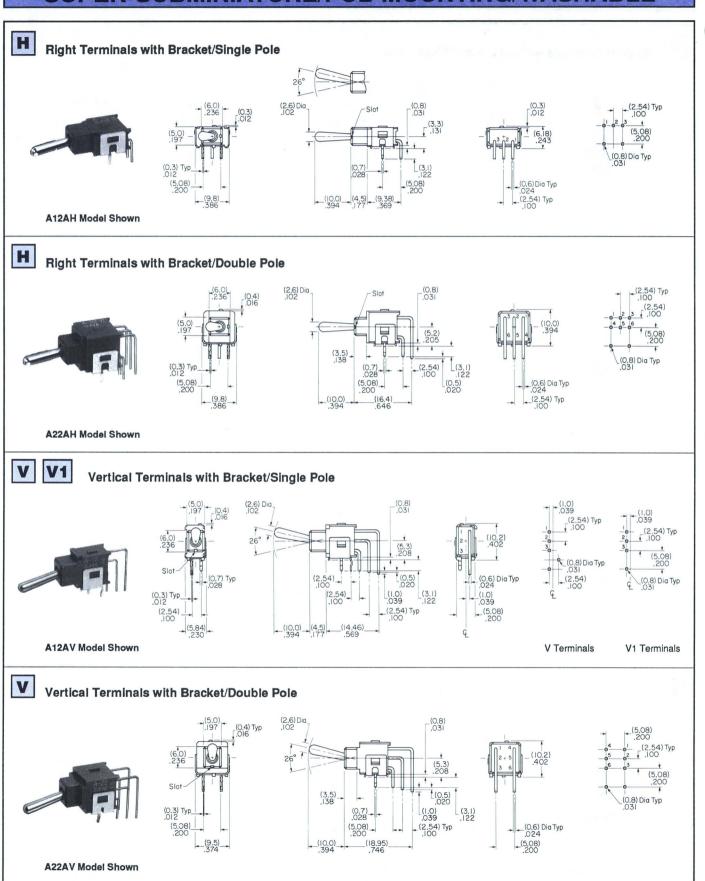






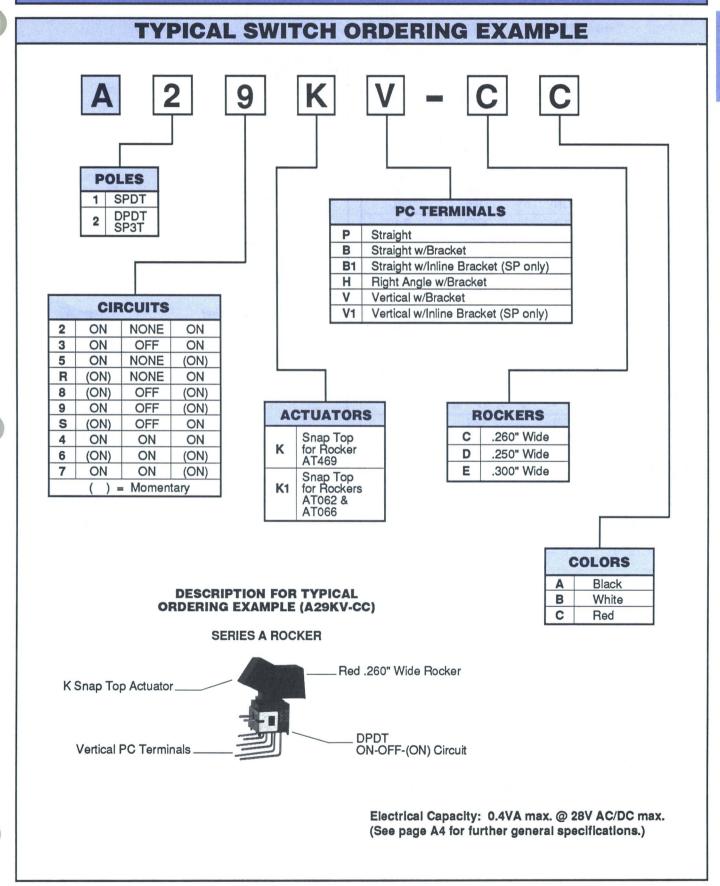
A22AB Model Shown

## SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE



# **NKK** SERIES A ROCKER SWITCHES

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE



# **NKK** SERIES A ROCKER SWITCHES

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE

	P	DLES AND	RCUITS				
		ROCKER POS	SITION & TERMI				
		(	) = Momentary				
POLE & THROW	MODEL	Up Slot-	Center	Down			
SPDT	A12 A13 A15 A1R A18 A19 A1S	ON ON ON (ON) (ON) ON (ON)	NONE OFF NONE NONE OFF OFF	ON ON (ON) (ON) (ON)			
CONNE TERMIN		2-3	OPEN	2-1			
SCHEM	SCHEMATIC 2 (COMM)						
DPDT	A22 A23 A25 A2R A28 A29 A2S	ON ON ON (ON) (ON) ON (ON)	NONE OFF NONE NONE OFF OFF	ON ON (ON) ON (ON) ON			
CONNE TERMIN		2-3 5-6	OPEN	2-1 5-4			
SCHEN	MATIC	10	92 (COMM) 59 •3 4• •6				
SP3T	A24 A26 A27	ON (ON) ON	ON ON ON	ON (ON) (ON)			
CONNE TERMIN W/O EX CONNE	IALS TRA	2-3 5-6	2-3 5-4	2-1 5-4			
W/EXT CONNE	MATICS ERNAL ECTIONS	External Connection > 2(m) 5 5 (out) 5 (out)	Esternol Connection 7 2(in) 5 1(out) 3 4(out) 6(out)	External Connection			
Termina	al numbers are	not actually on sw	itch. Additional 3-c	on info page A5.			

#### PC TERMINALS

Gold Material Only Rated 0.4VA max. @ 28V max. AC/DC

Dimensions for the following terminals appear on the rocker drawings in this section.

P Straight

H Right Angle

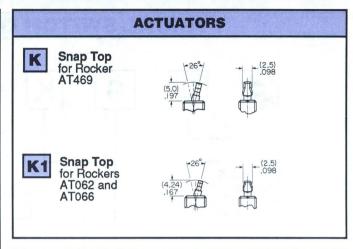
B Straight w/Bracket

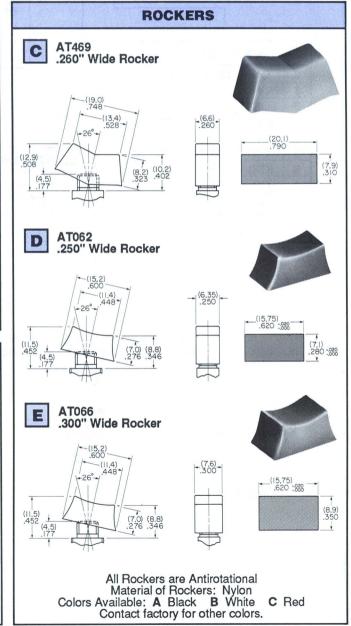
V Vertical

B1 Straight w/Inline Brkt

V1 Vertical w/Inline Brkt

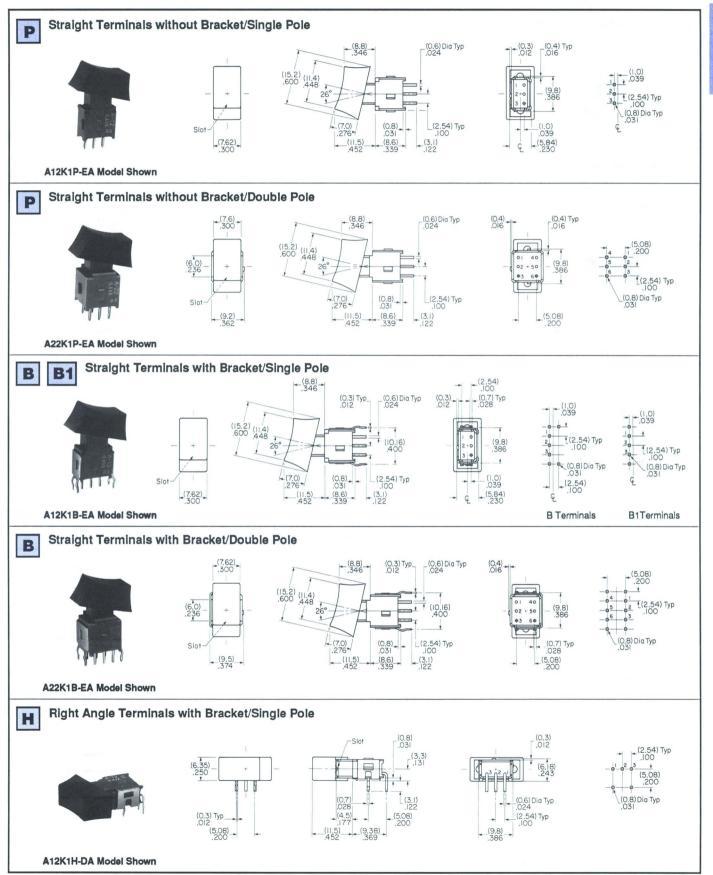
Dimensions for W, D, R, & T long length terminals appear in the toggle section.





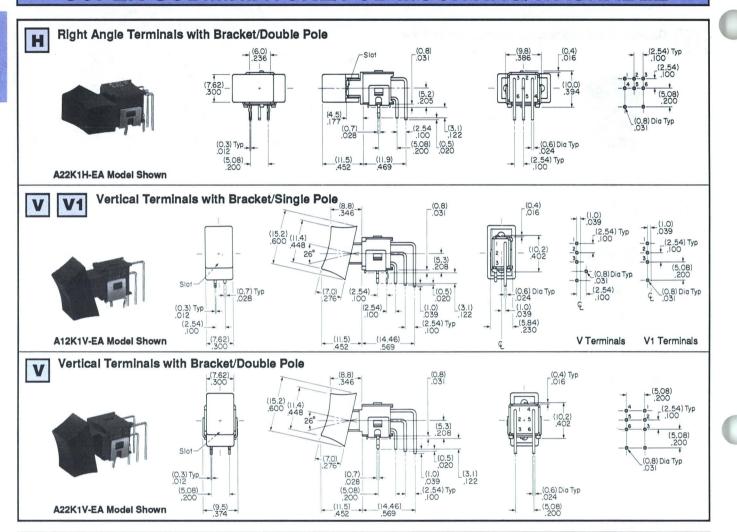
# **NKK®** SERIES A ROCKER SWITCHES

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE



# **NKK** SERIES A ROCKER SWITCHES

#### SUPER-SUBMINIATURE/PCB MOUNTING/WASHABLE



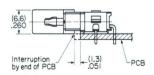
#### **ROCKER MOUNTING PRECAUTION**

Rocker switches with vertical and right angle terminals must be mounted so that extension of the PC board beyond the top of the switch housing does not interrupt rocker movement, in turn causing incomplete switching operation.

The MAXIMUM limit of the PC board extension is 1.3mm (.051"), as illustrated below.

This precaution does not apply to the double pole switch with right angle terminals due to the extra width of the switch allowing the rocker to clear the PC board.

End View of Rocker Right Angle Mounting PC Single Pole Only



Side View of Rocker Vertical Mounting PC Single and Double Pole

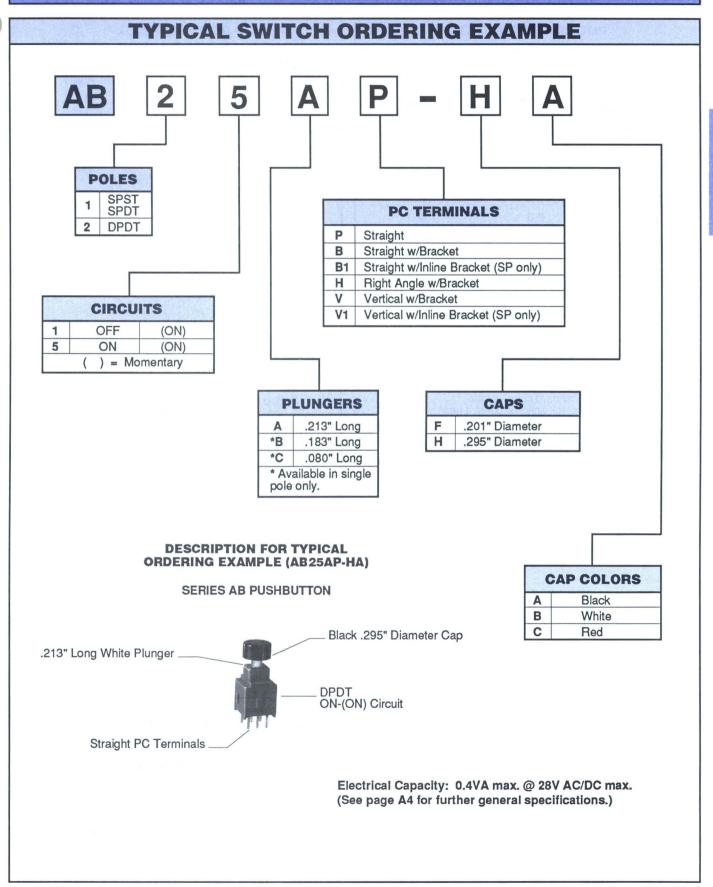
# Interruption (1.3) by end of PCB

#### **PCB MOUNTING AND SOLDERING CONSIDERATIONS**

The use of a support bracket or placement of the square bushing in a panel cutout is recommended to increase PCB mounting stability.

Soldering time and temperature limits are 3 seconds at 350°C or 5 seconds at 270°C.

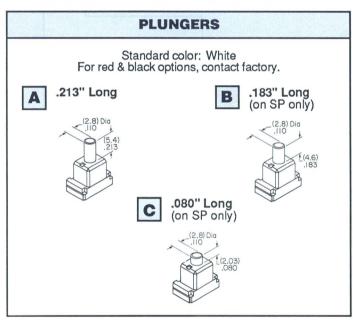
# **SERIES A PUSHBUTTON SWITCHES**

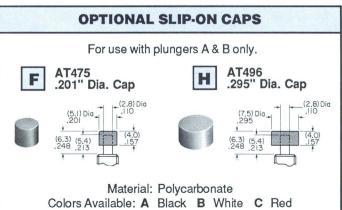


## **NKK** SERIES A PUSHBUTTON SWITCHES

#### SUPER-SUBMINIATURE/PCB/MOMENTARY/WASHABLE

#### **POLES AND CIRCUITS** PLUNGER POSITION & TERMINAL NUMBERS ) = Momentary Normal Down POLE & THROW MODEL SPST **AB11 OFF** (ON) CONNECTED TERMINALS **OPEN** 3-1 INTERNAL **SCHEMATIC** SPDT AB15 ON (ON) CONNECTED TERMINALS 2-3 2-1 ●2 (COMM) **SCHEMATIC** DPDT **AB25** ON (ON) CONNECTED 2-3 5-6 2-1 5-4 TERMINALS **SCHEMATIC** Terminal numbers are not actually on the switch.





#### PC TERMINALS

P&B

Straight



Right Angle







Vertical



P, B, B1, H, V, & V1 terminal dimensions appear on the pushbutton drawings which follow.

Dimensions for long length terminals W, D, R, & T appear on page A7.

#### **PCB MOUNTING & SOLDERING**

The use of a support bracket or placement of the square bushing in a panel cutout is recommended to increase PCB mounting stability.

Soldering time and temperature limits are 3 seconds at 350°C or 5 seconds at 270°C.

Alcohol cleaning solvents are recommended.

#### **OPTIONAL SNAP-IN PANEL MOUNTS**

Optional Snap-in Panel Mounts Available:

AT530 for Single Pole AT531 for Single & Double Pole

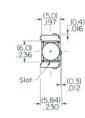
See Accessories section in the Supplement at the end of this catalog.

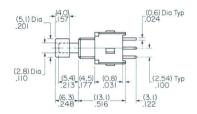
# **NKK** SERIES A PUSHBUTTON SWITCHES

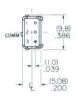
#### SUPER-SUBMINIATURE/PCB/MOMENTARY/WASHABLE











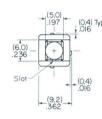


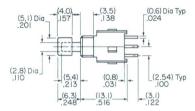
AB15AP-FA Model Shown

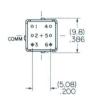
AB11 models do not have terminal 2.

#### Straight Terminals without Bracket/Double Pole









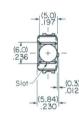


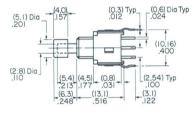
AB25AP-FA Model Shown

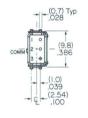
#### B Straight Terminals with Bracket/Single Pole

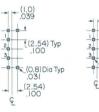


B









(0.8) Dia Typ

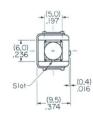
AB15AB-FA Model Shown

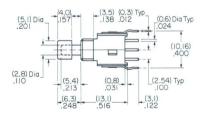
**B** Terminals

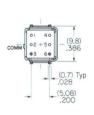
**B1** Terminals

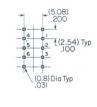
#### Straight Terminals with Bracket/Double Pole







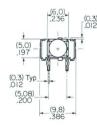


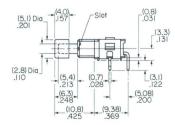


AB25AB-FA Model Shown

#### Right Angle Terminals with Bracket/Single Pole (Single Throw)







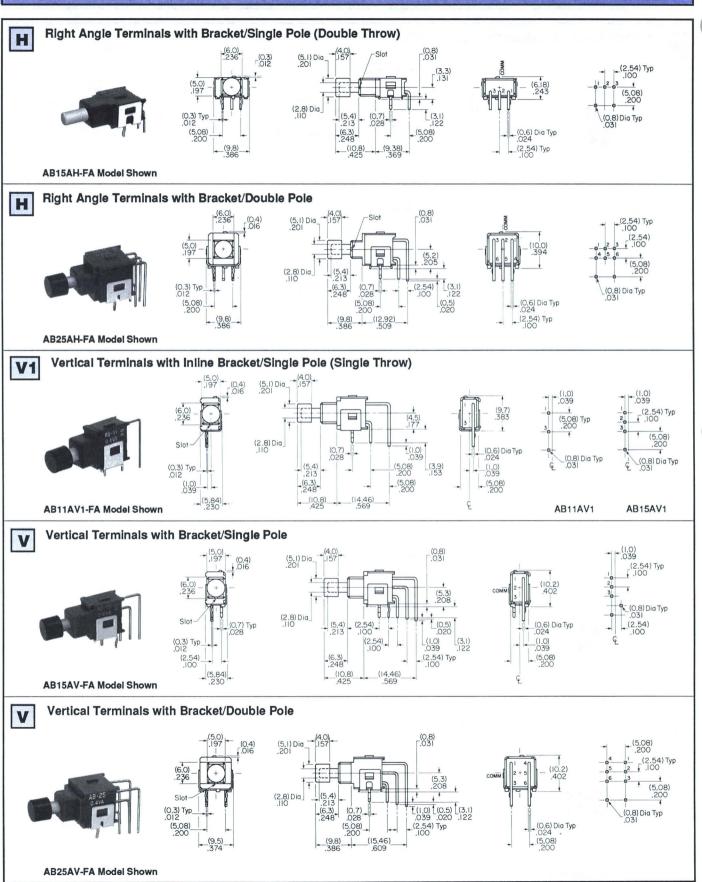




AB11AH-FA Model Shown

## **NKK** SERIES A PUSHBUTTON SWITCHES

#### SUPER-SUBMINIATURE/PCB/MOMENTARY/WASHABLE





#### SUPER-SUBMINIATURE/PCB MOUNTING

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: 0.4VA maximum @ 28V AC/DC maximum (Resistive Load) (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance: 50 milliohms maximum

Insulation Resistance: 500 megohms minimum @ 500V DC

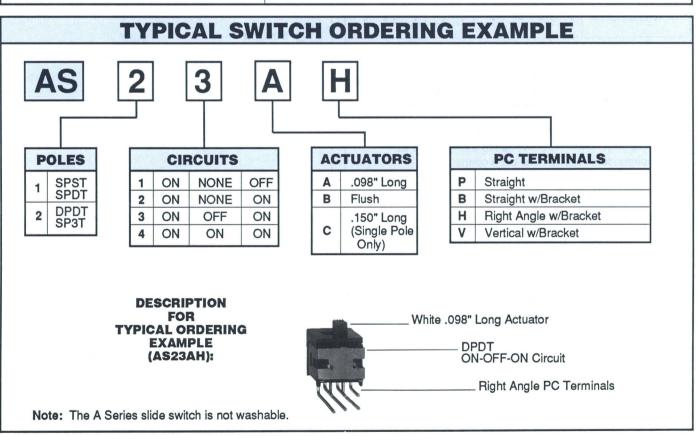
Dielectric Strength: 500V AC minimum

Mechanical Life:50,000 operations minimumElectrical Life:50,000 operations minimum

Ambient Temp Range: -10°C through +85°C (+14°F through +185°F)

Total Travel: 2.5mm (.098")
Nominal Operating Force: 260 grams

MATE	MATERIALS & FINISHES					
Actuator	Fiberglass reinforced polyamide					
Upper Case Housing	Carbon composite polyacetal					
Lower Case Housing	Fiberglass reinforced polyamide					
Support Bracket	Tin plated phosphor bronze					
Movable Contact	Phosphor bronze with gold plating over silver plating					
Stationary Contacts	Brass with gold plating over nickel undercoating					
Terminals	Brass with gold plating over nickel undercoating					



# **NKK** SERIES A SLIDE SWITCHES

#### **POLES AND CIRCUITS** SLIDE POSITION & TERMINAL NUMBER ( ) = Momentary Up Center Down POLE & THROW MODEL SPST **AS11** ON NONE **OFF** CONNECTED 3-1 **OPEN OPEN TERMINALS** - INTERNAL CONNECTION **SCHEMATIC** NONE **AS12** ON ON SPDT **AS13** ON OFF ON CONNECTED TERMINALS **OPEN** 2-1 2-3 92 (COMM) **SCHEMATIC** •3 **AS22** ON NONE ON **DPDT** AS23 ON OFF ON CONNECTED 2-1 5-4 **OPEN** 2-3 5-6 TERMINALS 2 (COMM) 59 SCHEMATIC ON ON ON SP3T AS24 CONNECTED TERMINALS 2-1 5-4 2-3 5-4 2-3 5-6 W/O EXTRA CONNECTION **SCHEMATICS** W/EXTERNAL CONNECTIONS

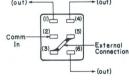
Terminal numbers are not actually on the switch. Contacts for AS24 are shorting; all other models are nonshorting

#### THREE-ON POSITIONS

In the manufacture of the AS24 model, a double pole double throw switch is converted to a single pole with 3 independent circuits. The extra connection shown in the diagram must be made during field installation.

Note that terminal numbers are not actually indicated on the switch.





#### PCB MOUNTING AND SOLDERING

The use of a support bracket is recommended to increase PCB mounting stability.

Soldering time & temperature limits:

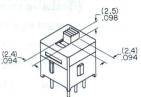
3 seconds at 350°C

5 seconds at 270°C

#### **ACTUATORS**

Actuator Color: White standard

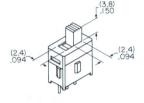
.098" Long



B Flush



C .150" Long (Single Pole Only)



Note: To obtain information regarding other color options, contact the factory.

#### PC TERMINALS

Straight





Right Angle w/Bracket







P, B, H & V terminal dimensions appear on the slide drawings which follow.

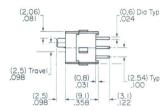
Dimensions for W, D, R, & T long length terminals appear in the toggle section.

# KK SERIES A SLIDE SWITCHES













AS12AP Model Shown

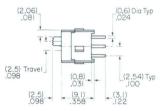
(Actuator shown in UP position.)

Single throw models do not have terminal 2.

#### P Straight PC Terminals without Bracket/Double Pole











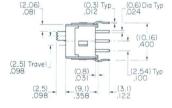
AS22AP Model Shown

(Actuator shown in UP position.)

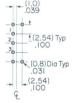
#### B Straight PC Terminals with Bracket/Single Pole









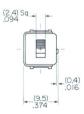


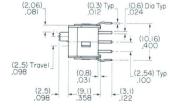
AS12AB Model Shown

(Actuator shown in UP position.)

#### B Straignt PC Terminals with Bracket/Double Pole











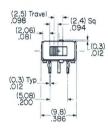
AS22AB Model Shown

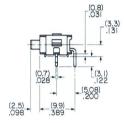
(Actuator shown in UP position.)

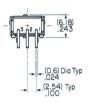
# **NEW SERIES A SLIDE SWITCHES**











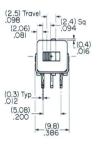


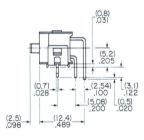
**AS12AH Model Shown** 

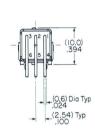
(Actuator shown in UP position.)

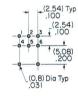
#### H Right Angle PC Terminals with Bracket/Double Pole









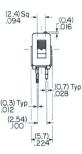


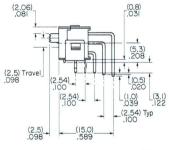
AS22AH Model Shown

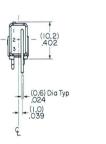
(Actuator shown in UP position.)

#### Vertical PC Terminals with Bracket/Single Pole









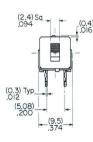
(0.8) Dia Typ - .031

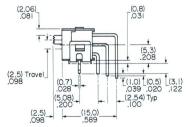
**AS12AV Model Shown** 

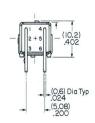
(Actuator shown in UP position.)

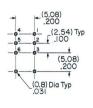
#### V Vertical PC Terminals with Bracket/Double Pole









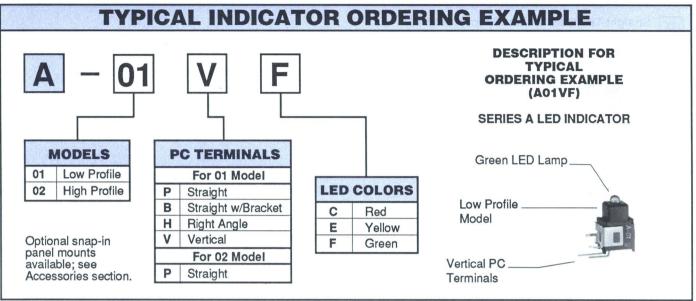


**AS22AV Model Shown** 

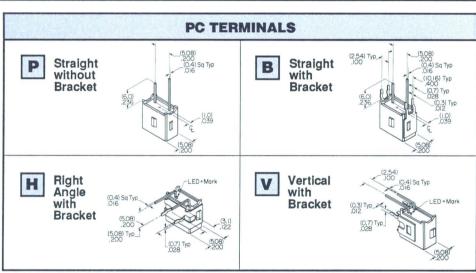
(Actuator shown in UP position.)

# **NKK** SERIES A LED INDICATORS

#### SUPER-SUBMINIATURE/PCB MOUNTING





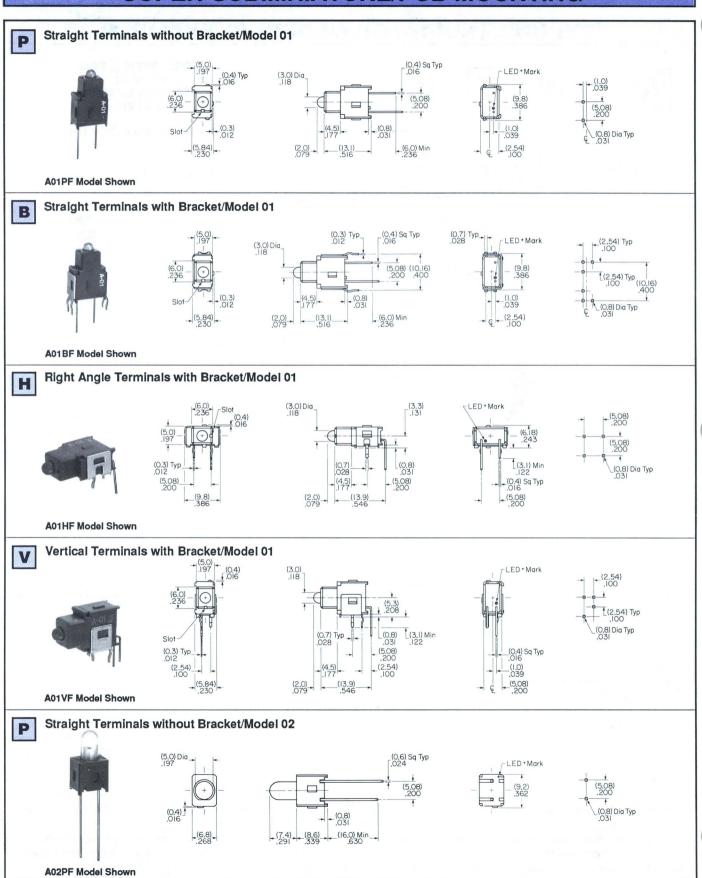


ELECTRICAL SPECIFICATIONS FOR LEDS							
		А	01 Indicator			A02 Indicate	or
Lamp Color		Red	Yellow	Green	Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	50mA	50mA	50mA	25mA	30mA	30mA
Continuous Forward Current	ΙF	30mA	30mA	30mA	20mA	20mA	20mA
Forward Voltage	٧ <sub>F</sub>	1.7V	2.2V	2.1V	2.1V	2.1V	2.2V
Reverse Peak Voltage	V <sub>RM</sub>	4V	4V	4V	4V	4V	4V
Current Reduction Rate Above 25°C	Δl <sub>F</sub>	0.67mA/°C	0.67mA/°C	0.67mA/°C	0.33mA/°C	0.40mA/°C	0.40mA/°C

The electrical specifications shown above are determined at a basic temperature of 25°C. If the source voltage exceeds the LED's rated voltage, the required ballast resistor value can be calculated by using the formula and table of lamp resistor values located at the end of this catalog. Ambient operating temperature for these LEDs:  $-25^{\circ}$ C  $\sim +85^{\circ}$ C ( $-13^{\circ}$ F  $\sim +185^{\circ}$ F).

# **NKK®** SERIES A LED INDICATORS

#### SUPER-SUBMINIATURE/PCB MOUNTING



# SERIES B

# WASHABLE SUPER-SUBMINIATURE ANTISTATIC SWITCHES

• TOGGLES • PUSHBUTTONS



# NKK® SERIES B

SUPER-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

#### **DISTINCTIVE FEATURES**



Available with toggles, paddles, and pushbuttons.

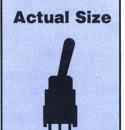
Industry's smallest alternate action pushbutton

Locking lever mechanism offered as a toggle option.

Smooth round 6mm diameter \_bushing simplifies panel layout.

Antistatic superstructure prevents static discharge to the contacts.

Patented Sliding Twin Crossbar (STC) \_contact mechanism provides smoother, positive detent and more reliable logic-level operation.



Totally sealed body prevents \_\_\_ contact contamination and allows wave soldering and washing.

.100" x .100" terminal spacing conforms to standard PC board grids.

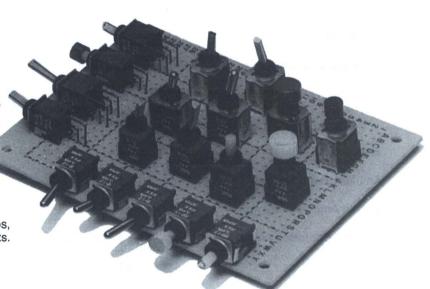
# nkk series B

#### SUPER-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

#### **APPLICATIONS**

- Toggles
- Pushbuttons

Ultraminiaturized B Series PC mountable switches feature an antistatic bushing which is smooth and round, Sliding Twin Crossbar (STC) contacts and sealed construction. They are recommended for use in products where reliability is essential and space is restricted. Typical applications include computers, peripherals, communications systems, medical equipment, home videos, cameras and small measuring instruments.



#### **ANTISTATIC CONSTRUCTION**

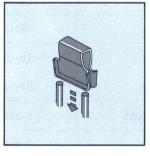


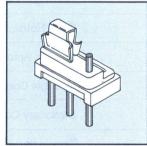
The switch is grounded to the PC board by means of the carbon impregnated bushing and the support bracket. Static electricity from an operator's touch travels a safe path from actuator through the bushing and bracket to the PC board, rather than traveling into the contacts.

#### **SEALED FOR WASHABILITY**

Sealed-body construction permits Series B switches to be subjected to time- and money-saving automated soldering techniques. As a result, they can be safely cleaned of flux without fear of compromising operating characteristics.

#### STC CONTACT MECHANISM





NKK's patented, award-winning STC contact mechanism offers benefits unavailable in conventional mechanisms. The movable twin contact surfaces pinch the stationary contacts to provide increased contact stability and unparalleled logic-level reliability. Continued reliability is assured since the gold-plated contacts are wiped clean with each actuation. Furthermore, if one side of the twin contacts should fail to conduct, the other side functions as a backup, or fail-safe path for the current. The combination of rounded movable and stationary contacts provides smooth contact feel previously unavailable in sliding contact type mechanisms.

#### SUPER-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

0.4VA maximum @ 28V AC/DC maximum

(Applicable Range 0.1 mA ~ 0.1 A @ 20 mV ~ 28 V)

Contact Resistance:

50 milliohms maximum

Insulation Resistance:

500 megohms minimum @ 500V DC

Dielectric Strength:

500V AC minimum

Mechanical Life:

100,000 operations minimum for ON-NONE-ON & ON-OFF-ON

50,000 operations minimum for other circuits

50,000 operations minimum for locking lever models

**Electrical Life:** 

50,000 operations minimum

**Ambient Temp Range:** 

-25°C through +70°C (-13°F through +158°F)

Toggle Angle of Throw:

26°

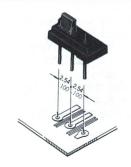
**Nominal Operating Force:** 

Toggles A & E & K w/Long Paddle: 150g (momentary); 120g (maintained) Toggles J & H & K w/Short Paddle: 278g (momentary); 188g (maintained)

Toggle L: 60g

	MATERIALS & FINISHES						
Toggle	Nickel plated brass						
Bushing	Carbon blended polyamide; nickel plated zinc alloy for locking levers						
Case Housing	Glass fiber reinforced polyamide						
Support Bracket	Tin plated phosphor bronze						
Movable Contact	Phosphor bronze with gold plating over silver plating						
Stationary Contacts	Brass with gold plating over nickel undercoating						
Terminals	Brass with gold plating over nickel undercoating						

#### .100 INCH TERMINAL SPACING



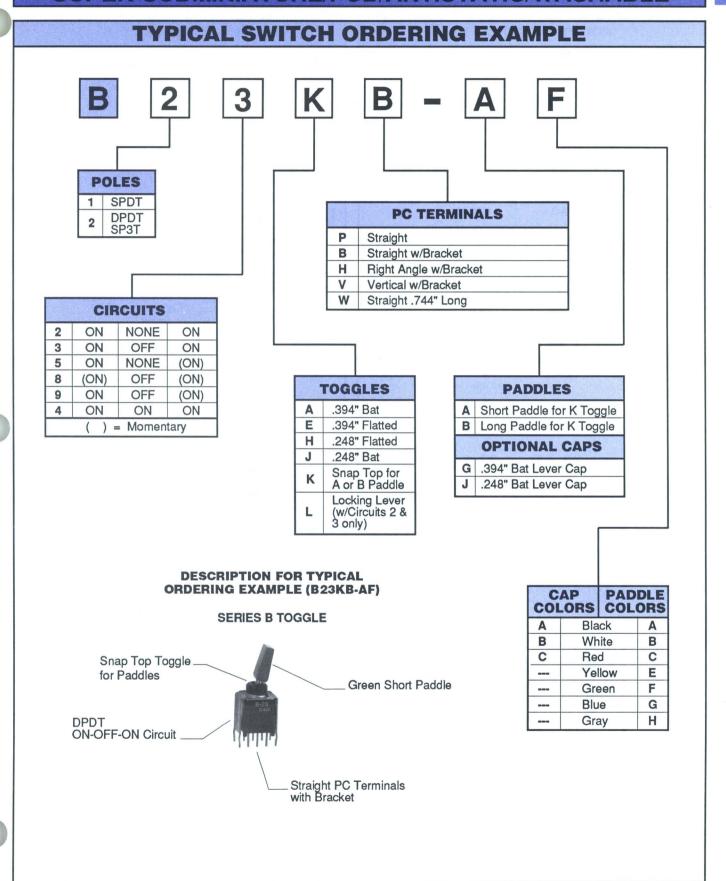
Standard 2.54mm x 2.54mm (.100" x .100") grid spacing and 0.6mm (.024") diameter terminals simplify PC board mounting.

#### **MOLDED-IN TERMINALS**



Terminals are molded in the base and epoxy sealed to prevent flux, solvents, and other contaminants from reaching the contacts.

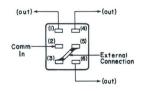
#### SUPER-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

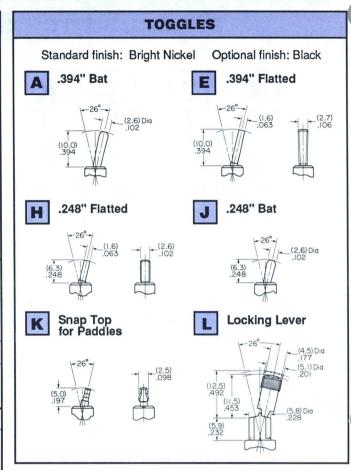


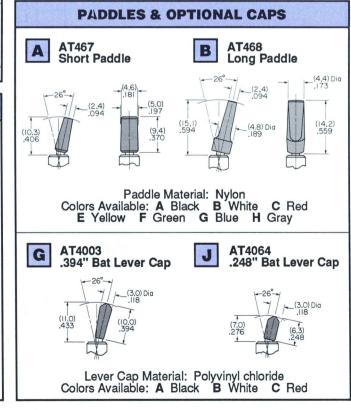
POLES AND CIRCUITS				
TOGGLE POSITION & TERMINAL NUMBE				
POLE &		Up	Center	Down
THROW	MODEL	Slot		
	B12 B13	ON ON	NONE OFF	ON ON
SPDT	B15	ON	NONE	(ON)
	B18 B19	(ON) ON	OFF OFF	(ON) (ON)
CONNECTED TERMINALS		2-3	OPEN	2-1
SCHEM	IATIC	9.2 (COMM) 1.0 •3		
DPDT	B22 B23 B25 B28 B29	ON ON ON (ON) ON	NONE OFF NONE OFF	ON ON (ON) (ON)
CONNECTED TERMINALS		2-3 5-6	OPEN	2-1 5-4
SCHEMATIC 1 0 2 (COMM) 59 06				
SP3T	B24	ON	ON	ON
CONNECTED TERMINALS W/O EXTRA CONNECTIONS		2-3 5-6	2-3 5-4	2-1 5-4
SCHEMATICS W/EXTERNAL CONNECTIONS		External Connection— 2(in) 5 1(out) 3 4(out) 6(out)	External Connection > 2(in) 5 1 (out) 3 4(out) 6(out)	External Connection - 2(in) 5 5 1 (out) 5 4 (out) 6 (out)
Terminal numbers are not actually on the switch.				

#### **THREE-ON POSITIONS**

In the manufacture of the B24 model, a double pole double throw switch is converted to a single pole with 3 independent circuits. The extra connection shown in the diagram must be made during field installation. Note that terminal numbers are not actually indicated on the switch.

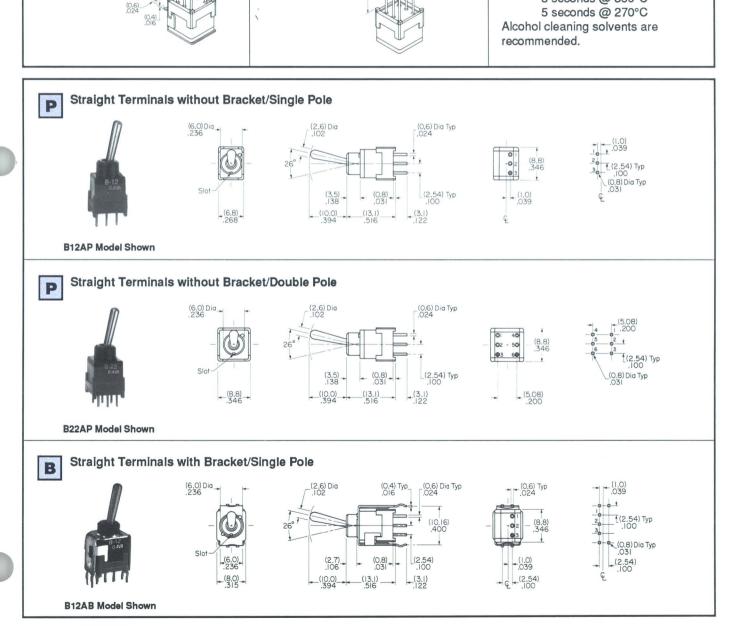






## **NKK** SERIES B TOGGLE SWITCHES

#### PC TERMINALS H B (2.54) Typ .100 (0.5) (0.6) Dia Typ\_.020 .024 ... 6) Dia Typ Straight Right with Angle **Bracket** with (3.1) **Bracket** The use of a support bracket or W placement of the round bushing in a panel cutout is recommended Straight to increase PCB mounting stability. .744" Long Soldering time & temperature limits: 3 seconds @ 350°C



P

V

with

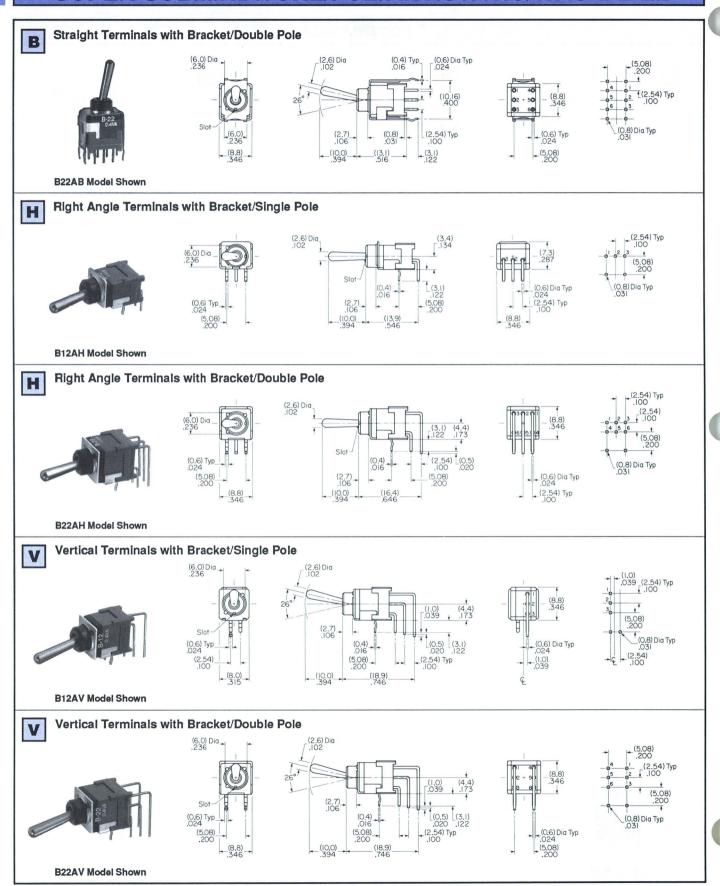
Vertical

**Bracket** 

Straight

## **NKK** SERIES B TOGGLE SWITCHES

#### SUPER-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE



## **SERIES B PUSHBUTTON SWITCHES**

#### **MOMENTARY & ALTERNATE/ANTISTATIC/WASHABLE**

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 0.4VA maximum @ 28V AC/DC maximum

(Resistive Load) (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance: 50 milliohms maximum

Insulation Resistance: 500 megohms minimum @ 500V DC

Dielectric Strength: 500V AC minimum

Mechanical Life: 50,000 operations min (momentary); 25,000 operations min (alternate action)

**Electrical Life:** 50,000 operations min (momentary); 25,000 operations min (alternate action)

**Ambient Temp Range:** -25°C through +70°C (-13°F through +158°F)

Momentary: Pretravel 0.7mm (.028"); Overtravel 0.4mm (.016"); Total 1.1mm (.043") Alternate: Pretravel 1.0mm (.039"); Overtravel 1.0mm (.039"); Total 2.0mm (.079") Travel:

**Nominal Operating Force:** 260 grams (momentary); 300 grams (alternate action)

	MATERIALS & FINISHES						
Plunger	Polyacetal						
Bushing	Carbon blended polyamide						
Case Housing	Glass fiber reinforced polyamide						
Support Bracket	Tin plated phosphor bronze						
Movable Contact	Phosphor bronze with gold plating over silver plating						
Stationary Contacts	Brass with gold plating over nickel undercoating						
Terminals	Brass with gold plating over nickel undercoating						

#### **SEALED FOR WASHABILITY**

Sealed-body construction permits Series B pushbutton switches to be subjected to time- and money-saving automated soldering techniques. They can be safely cleaned of flux without fear of compromising operating characteristics; the actuator must be in UP position during washing and cap removal. Alcohol cleaning solvents are recommended.

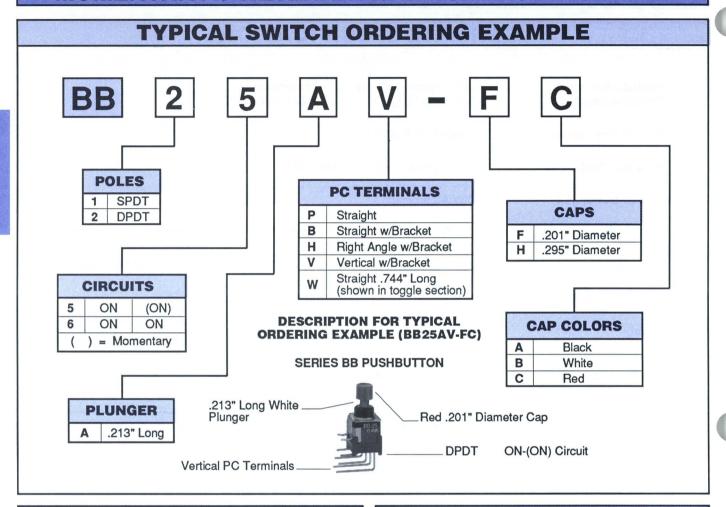
#### **LATCHDOWN DIMENSIONS**



The latchdown feature on maintained circuits provides visible, audible, and tactile feedback.

## **NKK** SERIES B PUSHBUTTON SWITCHES

#### **MOMENTARY & ALTERNATE/ANTISTATIC/WASHABLE**

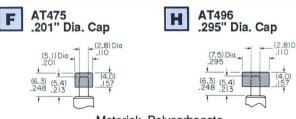


POLES AND CIRCUITS							
			& TERMINAL NUMBERS formentary				
POLE & THROW	MODEL	Normal	Down				
SPDT	BB15 BB16	ON ON	(ON) ON				
CONNEC TERMIN		2-3	2-1				
SCHEM	ATIC	9 2 (COMM)					
DPDT	BB25 BB26	ON ON	(ON) ON				
CONNECTED TERMINALS		2-3 5-6	2-1 5-4				
SCHEM	IATIC	92 (COMM) 59 •3 4• •6					
Terminal r	Terminal numbers are not actually on the switch.						

#### **TERMINALS**

Terminal dimensions are in the following drawings. Note that the single pole alternate action model is in a double pole base.

#### **OPTIONAL SLIP-ON CAPS**



Material: Polycarbonate Colors Available: A Black B White C Red Freon or alcohol cleaning solvents are recommended for protection of polycarbonate parts.

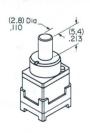
#### **PLUNGER**



.213" Long

Standard color: White

For other color options & plunger lengths, contact factory.



## **NKK** SERIES B PUSHBUTTON SWITCHES

#### **MOMENTARY & ALTERNATE/ANTISTATIC/WASHABLE**

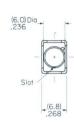
Single pole alternate action detail drawings and footprints are located at the end of the next page.

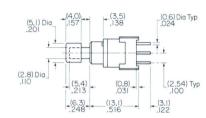


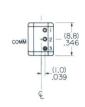
#### Straight Terminals without Bracket/Single Pole

#### For Single Pole Momentary











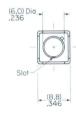
BB15AP-FA Model Shown

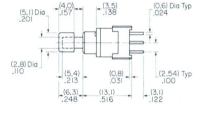


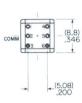
#### Straight Terminals without Bracket/Double Pole

For DP Momentary or SP & DP Alternate Action











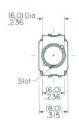
**BB25AP-FA Model Shown** 

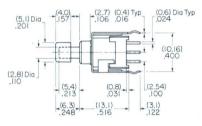


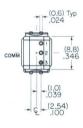
Straight Terminals with Bracket/Single Pole

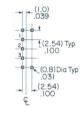
For SP Momentary











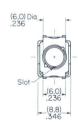
**BB15AB-FA Model Shown** 

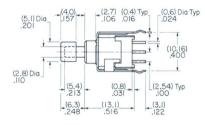
#### В

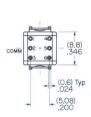
#### Straight Terminals with Bracket/Double Pole

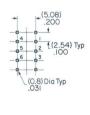
For DP Momentary or SP & DP Alternate Action











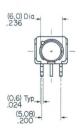
**BB25AB-FA Model Shown** 

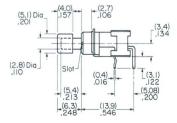
#### H

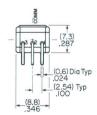
#### Right Angle Terminals with Bracket/Single Pole

#### For Single Pole Momentary





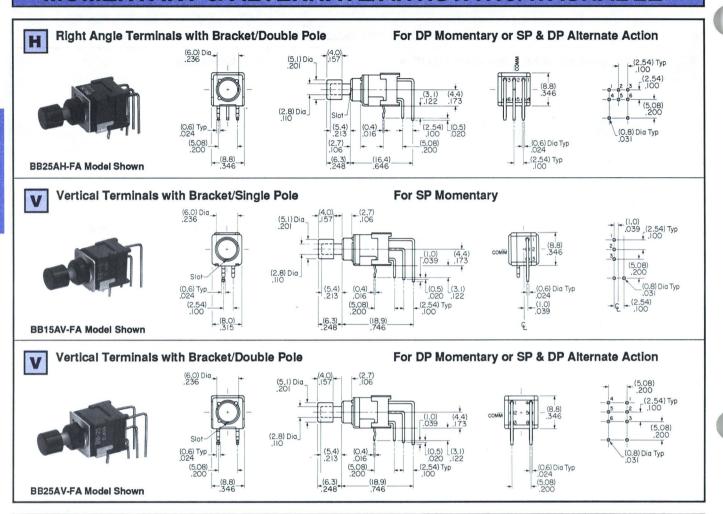




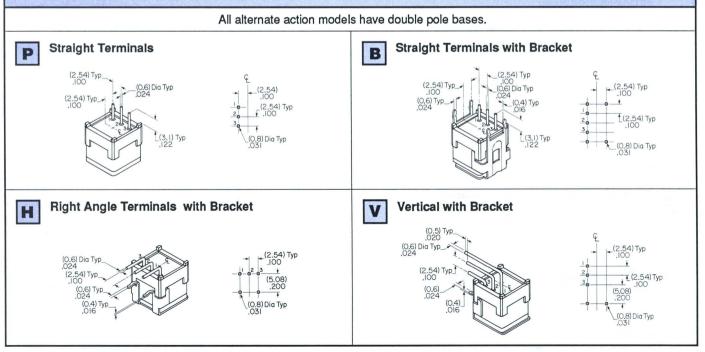


BB15AH-FA Model Shown

## **NKK** SERIES B PUSHBUTTON SWITCHES

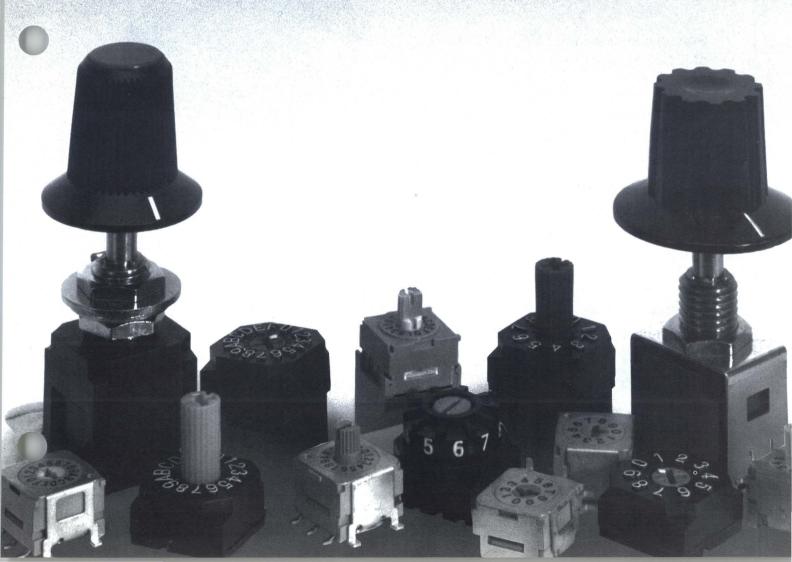


#### TERMINAL DETAIL & FOOTPRINTS FOR SINGLE POLE ALTERNATE ACTION MODELS



# SERIES DR & ND

# DIP ROTARY SWITCHES



## NKK® SERIES DR

**BINARY CODED/DIP ROTARY** 

#### **DISTINCTIVE FEATURES**

Highly visible legends and choice of screwdriver, shaft or dial adjusted actuators provide trouble-free code setting. Knob actuator also available.

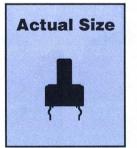
Detent mechanism gives crisp, positive action for accurate switch setting.

O-ring sealed actuator and selfwiping contacts assure contact reliability and continuity.

Sealed construction conforms to IP65 of IEC529 Standards.

Real or complementary code setting identified by color-keyed actuator.

> Crimped terminals ensure secure PC mounting and prevent dislodging during soldering.



Compact dimensions and low profile allow high density mounting and close stacking of PC boards.

> Ultrasonically welded case and insert \_ molded terminals seal out flux, dust, and other contaminants.

## **NKK®** SERIES DR ROTARY SWITCHES

#### **BINARY CODED/DIP ROTARY**

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

Switching Rating: 100mA @ 5V DC Nonswitching Rating: 100mA @ 50V DC

**Contact Resistance:** 

80 milliohms maximum (for all 4 contacts closed) 30 milliohms maximum (for 1 contact closed)

Insulation Resistance:

1,000 megohms minimum @ 250V DC

Dielectric Strength:

250V AC minimum

Mechanical Life:

20,000 detent operations minimum

Electrical Life:

20,000 detent operations minimum

Note: A detent operation is one actuator position operation or stepping. 20,000 detent operations = 1,250 cycles for hexadecimal devices or 2,000 cycles for decimal devices. A cycle is one 360° rotation.

Operating Torque:

120 ~ 260 grams-cm (1.7 ~ 3.6 ounce-in)

Ambient Temp Range:

-25°C through +75°C (-13°F through +167°F)

MATERIALS & FINISHES							
Shaft & Bushing (DRA only)	Brass with nickel plating						
Actuator	Polyacetal						
Housing & Case	Glass fiber reinforced PBT (UL 94V-0)						
O-rings	Nitrile butadiene rubber						
Base	Glass fiber reinforced PBT (UL 94V-0)						
Movable Contact	Copper with gold plating						
Stationary Contacts	Phosphor bronze with gold plating over nickel plating						
Terminals	Phosphor bronze with gold strike over nickel plating						

#### **APPLICATIONS**

DR Series answers the ever expanding need for highly reliable, variable circuit devices for programming electronic equipment. These switches are suitable for digital setting of computer peripherals, as data entry devices for address encoding and presetting of microcomputers, as simple PROMs, or for selection of input-output boards.

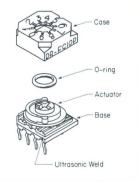
These rotaries are offered with either screwdriver, shaft, dial, or knob actuators. Real or complement code setting is available with either decimal or hexadecimal positions, and straight or right angle PC terminals with gold contacts. Terminals are spaced to conform to standard .100" grid spacing. Straight PC terminals are spaced .100" X .300" making them DIP socket compatible as well.

#### **SEALED BODY CONSTRUCTION**

Sealed construction of these switches is accomplished with an ultrasonically welded case and base, as well as an o-ring seal between the case and actuator. Insert molded terminals also prevent entry of contaminants.

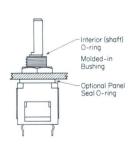
DR models are suitable for automated wave soldering and subsequent washing. It is recommended that washing be done at room temperature with detergentwater.

Manual soldering may be done for 3 seconds @ 350°C or for 5 seconds @ 270°C.



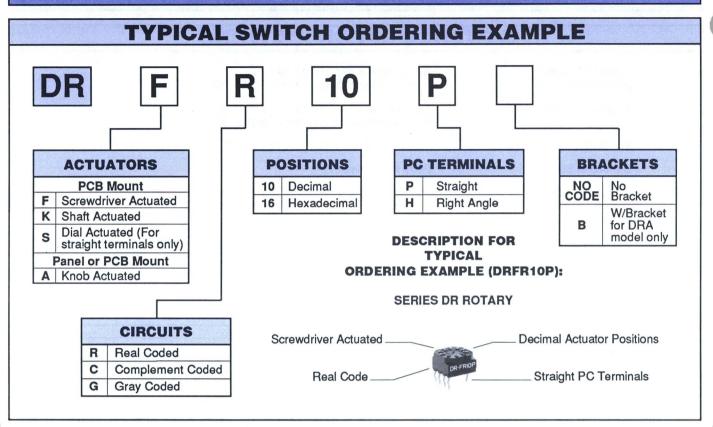
#### **OPTIONAL PANEL SEAL MOUNTING**

The knob actuated DRA models have a threaded bushing for panel mounting. The o-ring AT085 can be selected and installed behind the panel to achieve a panel seal which prevents splashed or sprayed liquids from getting behind the panel. This series can be provided with bracket for added stability in PCB mounting.



## **NKK** SERIES DR ROTARY SWITCHES

#### BINARY CODED/DIP ROTARY







#### Screwdriver Actuated



#### Dial Actuated

Adjusted with a flat or phillips tipped screwdriver or Snapin Knob AT4061.

Adjusted by hand or with a flat tipped screwdriver.









Knob Actuated

Adjusted by hand or with a flat or phillips tipped screwdriver.

Adjusted with Knob AT433, AT4103, or AT4104 (to be ordered separately)



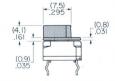


Actuators are fully rotational and operate either clockwise or counterclockwise. Real coded devices have orange actuators. Complement coded have red actuators.

	TRUTH TABLES																	
Actuator Positions					1	6	H	łex	ade	ecir	mal	Po	siti	ion	s			
	⊗ =	ON	10 Decimal Positions															
Terminal Number (Output)		0	1	2	3	4	5	6	7	8	9	Α	В	С	D	Е	F	
	Real Coded	1		0		0		0		0		0		0		0		0
	Model Numbers:	2			0	0			0	0			<b>②</b>	0			0	<b>③</b>
R	DRFR, DRKR,	4					0	0	<b>③</b>	0					0	0	<b>③</b>	0
	DRSR, & DRAR	8									<b>③</b>	0	0	0	0	0	⊗	<b>③</b>
Cor	nplement Coded	1	0		<b>®</b>		0		0		0		0		0		<b>®</b>	
Name of the last	Model Numbers:	2	0	0			0	⊗			0	⊗			0	⊗		
C	DRFC, DRKC,	4	0	<b>②</b>	<b>③</b>	<b>②</b>	1				0	0	<b>③</b>	0				
	DRSC, & DRAC	8	0	0	0	0	0	0	0	0								
	Gray Coded	1	Г	0	0			0	0			0	0			0	0	
	Model Numbers:	2			0	0	0	0					0	0	8	0		
G	DRFG, DRKG,	4					0	0	0	0	0	0	0	0				
	DRSG, & DRAG	8									0	0	0	0	0	0	0	0

## **OPTIONAL SNAP-IN KNOB**

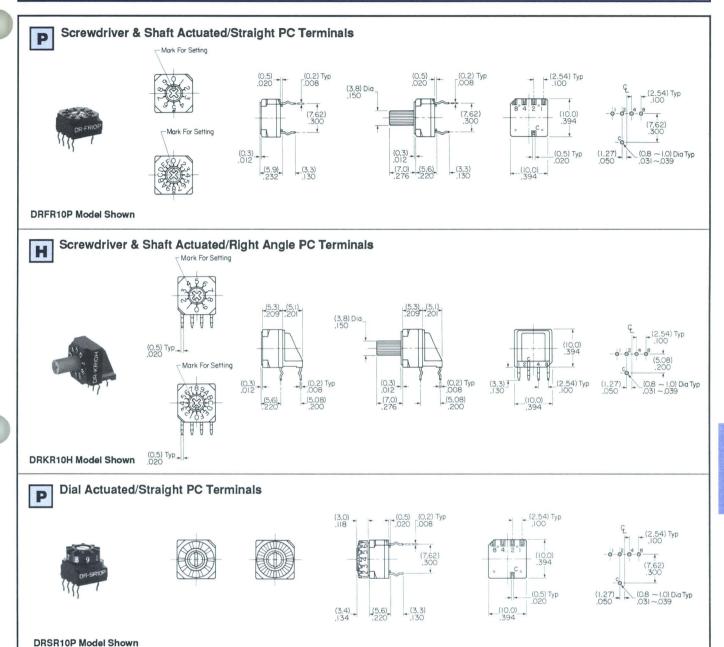
AT4061 Snap-in Knob for "F" **Actuator** Polycarbonate Black with clear flange



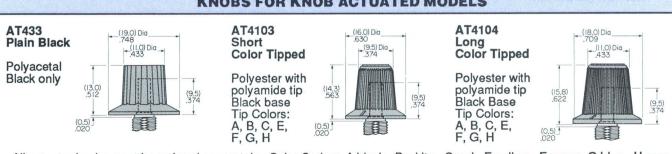
Install knob before mounting on PCB; it should not be removed once mounted. When mounting, align slit in knob with white pointer on actuator.

## KK SERIES DR ROTARY SWITCHES

#### CODED/DIP ROTARY



#### **KNOBS FOR KNOB ACTUATED MODELS**



All actuator knobs must be ordered separately. Color Codes: A black B white C red E yellow F green G blue H gray To install, position white line on the knob opposite (180°) the shaft flat when shaft is set for position 0 as shown in the dimension drawings.

PB

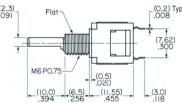
## **NKK** SERIES DR ROTARY SWITCHES

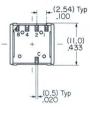
#### **BINARY CODED/DIP ROTARY**

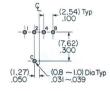










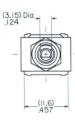


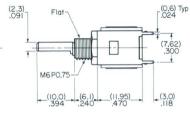
**DRAR10P Model Shown** 

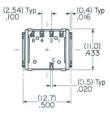
Shown in Position 0 with shaft flat rotated 180° from bushing flat.

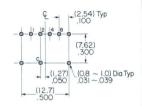
#### Knob Actuator/Straight PC Terminals with Bracket (Order Hardware Separately)









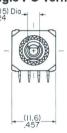


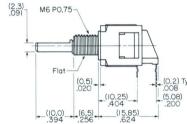
**DRAR10PB Model Shown** 

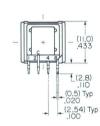
Shown in Position 0 with shaft flat rotated 180° from bushing flat.

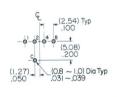
#### Knob Actuator/Right Angle PC Terminals without Bracket H









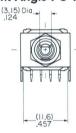


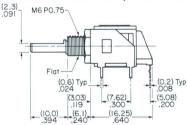
**DRAR10H Model Shown** 

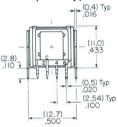
Shown in Position 0 with shaft flat rotated 180° from bushing flat.

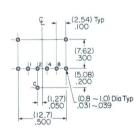
#### Knob Actuator/Right Angle PC Terminals with Bracket (Order Hardware Separately) HB











**DRAR10HB Model Shown** 

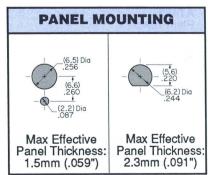
Shown in Position 0 with shaft flat rotated 180° from bushing flat.

#### HARDWARE SUPPLIED WITH UNBRACKETED MODELS









**⊈ WitChe** • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

## NKK SERIES ND

#### MICRO-SUBMINIATURE/BINARY CODED/DIP ROTARY

#### **DISTINCTIVE FEATURES**

Compact size and interlocking sides for high density, \_ side-by-side mounting.

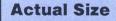
Sealed construction, prevents contact contamination and allows time- and money-saving automated soldering and washing.

Highly visible legends and choice of \_ screwdriver or shaft actuation to provide trouble-free code setting.

Detent mechanism designed for crisp, positive action for accurate switch setting.

Bifurcated, spring loaded contacts give unmatched logic-level reliability.

Heat tolerant resin used for body meets UL fire resistance rating 94VO and maintains switch reliability through automated soldering process.





Crimped terminals ensure \_\_\_\_\_\_ secure PC mounting and prevent dislodging during soldering.

.100" terminal grid spacing between pin centers, plus 3-by-3 terminal arrangement for footprint pattern equivalent to industry standard.

## **NKK** SERIES ND ROTARY SWITCHES

#### MICRO-SUBMINIATURE/BINARY CODED/DIP ROTARY

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** (Resistive Load)

Nonswitching Rating: 100mA @ 50V DC Switching Rating: 100mA @ 5V DC

Contact Resistance:

80 milliohms maximum (circuit) 30 milliohms maximum (contact point)

Insulation Resistance:

1,000 megohms minimum @ 250V DC

Dielectric Strength:

250V AC minimum

Mechanical Life:

20,000 detent operations minimum

**Electrical Life:** 

20,000 detent operations minimum

Note: A detent operation is one actuator position operation or stepping. 20,000 detent operations = 1,250 cycles for hexadecimal devices or 2,000 cycles for decimal devices. A cycle is one 360° rotation.

**Operating Torque:** 

50 grams-cm (0.70 ounce-in)

**Ambient Temp Range:** 

-25°C through +75°C (-13°F through +167°F)

MATERIALS & FINISHES						
Actuator	Glass fiber reinforced polyamide					
Housing	Glass fiber reinforced polyamide (UL 94V-0 flammability rating)					
O-ring	Nitrile butadiene rubber					
Base	Glass fiber reinforced polyamide (UL 94V-0 flammability rating)					
Movable Contact	Beryllium copper with gold plating over nickel					
Stationary Contacts	Brass with gold plating over nickel					
Terminals	Brass with gold plating over nickel					

#### **APPLICATIONS**

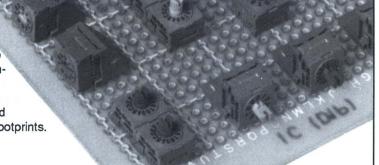
ND Series answers the ever expanding need for high reliability and versatility in many applications where digital setting is required: programming electronic equipment, in computer peripherals, as data entry devices for address encoding and presetting of microcomputers, as simple PROMs, or for selection of input-output boards.

These rotaries are offered with either screwdriver or shaft type actuators. Real or complement code setting is available with either decimal or hexadecimal positions, and straight or right angle PC terminals with gold contacts. Terminals are spaced to conform to standard .100" grid spacing. Both straight and right angle terminals are spaced .100" X .200" making them DIP socket compatible as well.

#### **WASHABILITY & UNIVERSAL FOOTPRINT**

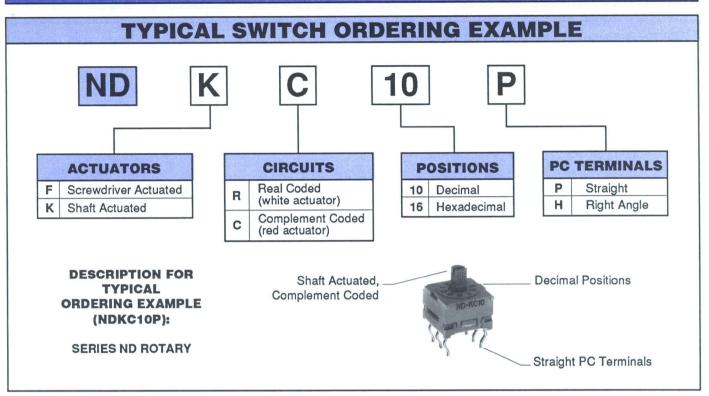
Sealed construction of these DIP rotary switches is accomplished with seals between the actuator and housing and between the housing and base. Insert molded terminals also prevent entry of contaminants. These combined features make the ND models washable in automated processing techniques. (Alcohol based solvents are recommended.)

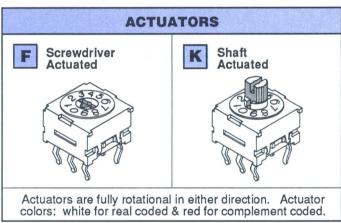
A standard footprint pattern with .100" terminal grid and 3-by-3 terminal arrangement match industry standard footprints.

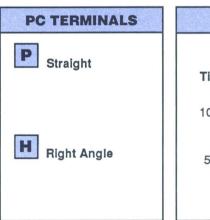


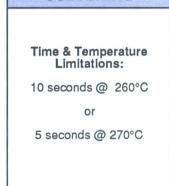
## **NKK** SERIES ND ROTARY SWITCHES

#### MICRO-SUBMINIATURE/BINARY CODED/DIP ROTARY









SOLDERING

CIRCUITS & POSITIONS						
Additional information in table at right.						
Real Coded Circuit						
Complement Coded Circuit						
Decimal - 10 Positions						
Hexadecimal - 16 Positions						

	TI	RU	TI	11	ΓΑΙ	BL	ES	3									
Actuator Positi	ons	16 Hexadecimal Positions															
⊗ = ON		10 Decimal Positions															
Terminal Number (Output)	\	0	1	2	3	4	5	6	7	8	9	Α	В	С	D	Е	F
Real Coded	1		0		0		0		0		0		0		0		0
	2			0	<b>(S)</b>			0	<b>(3)</b>			0	0			0	0
Model Numbers:	4					0	<b>③</b>	0	0					0	0	0	0
NDFR & NDKR	8									0	0	⊗	0	0	0	<b>®</b>	0
Complement Coded	1	0		0		0		0		0		0		0		0	
	2	0	0			0	0			0	0			0	0		
Model Numbers:	4	0	0	<b>⊗</b>	0					0	0	0	0				
NDFC & NDKC	8	0	0	0	0	0	0	0	0								

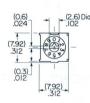
## KK SERIES ND ROTARY SWITCHES

#### MICRO-SUBMINIATURE/BINARY CODED/DIP

P

#### Screwdriver Actuated/Straight PC Terminals











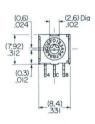
NDFR10P Model Shown

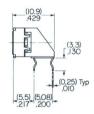
Terminal numbers not on switch.

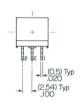


#### Screwdriver Actuated/Right Angle PC Terminals











NDFC16H Model Shown

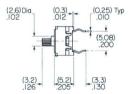
Terminal numbers on terminal cover.



#### Shaft Actuated/Straight PC Terminals











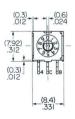
NDKC16P Model Shown

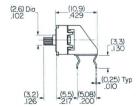
Terminal numbers not on switch.

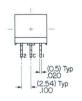


#### Shaft Actuated/Right Angle PC Terminals











NDKR10H Model Shown

Terminal numbers on terminal cover.

## NKK® SERIES ND3

#### SURFACE MOUNT/BINARY CODED/DIP ROTARY

#### **DISTINCTIVE FEATURES**

Compact size plus terminal design for high density, side-by-side surface mounting.

Vapor phase solderable because of highly heat resistant resins used in construction.

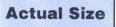
Sealed construction prevents contact contamination and allows time- and money-saving automated soldering and washing.

Highly visible legends and choice of \_screwdriver or shaft actuation to provide trouble-free code setting.

Detent mechanism designed for crisp, positive action for accurate switch setting.

Bifurcated, spring loaded contacts give unmatched logic-level reliability.







Gull-winged terminals ensure mechanical stability during soldering and simplify solder joint inspection.

Epoxy seal on terminals locks out flux, solvents, and other contaminants.

## **NKK®** SERIES ND3 ROTARY SWITCHES

#### SURFACE MOUNT/BINARY CODED/DIP ROTARY

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: Nonswitching Rating: 100mA @ 50V DC (Resistive Load) Switching Rating: 100mA @ 5V DC

Contact Resistance: 80 milliohms maximum (circuit)

30 milliohms maximum (contact point)

Insulation Resistance: 1,000 megohms minimum @ 250V DC

Dielectric Strength: 250V AC minimum

Mechanical Life: 20,000 detent operations minimum

Electrical Life: 20,000 detent operations minimum

Note: A detent operation is one actuator position operation or stepping. 20,000 detent operations = 1,250 cycles for hexadecimal devices or 2,000 cycles for decimal devices. A cycle is one 360° rotation.

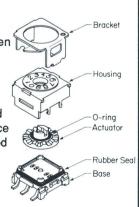
Operating Torque: 50 grams-cm (0.70 ounce-in)

Ambient Temp Range: -25°C through +75°C (-13°F through +167°F)

MATERIALS & FINISHES							
Actuator	Glass fiber reinforced polyamide						
Housing Glass fiber reinforced polyamide (UL 94V-							
O-ring Nitrile butadiene rubber							
Base	Glass fiber reinforced polyamide (UL 94V-0)						
Movable Contact	Beryllium copper with gold plating over nickel						
Stationary Contacts	Brass with gold plating over nickel						
Terminals	Brass with gold plating over nickel						

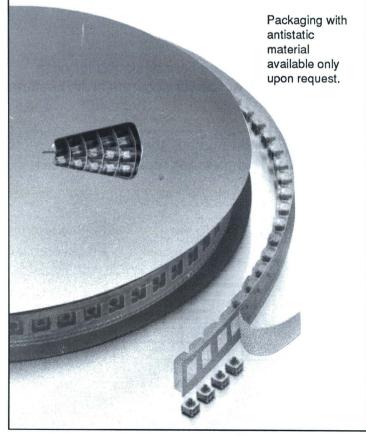
#### **SEALED BODY CONSTRUCTION**

Sealed construction of the ND3
Series DIP rotary switches is
accomplished with seals between
the actuator and housing and
between the housing and base;
insert-molded, epoxy-sealed
terminals also prevent entry of
contaminants. These combined
features, plus the heat resistance
of the resins and adhesives used
in construction, allow the ND3
models to be vaporphase or
wave soldered. Alcohol based
solvents recommended.



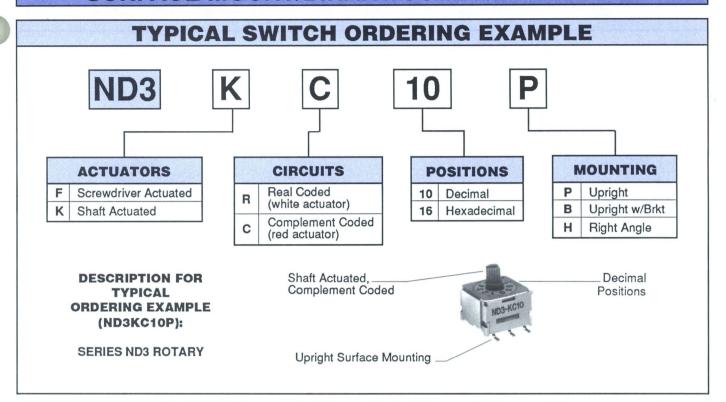
#### **TAPE-REEL PACKAGING**

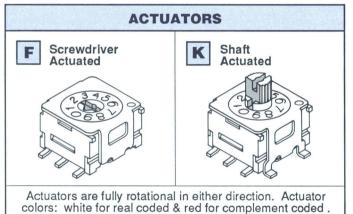
ND3 devices are packaged in a tape-reel 24mm wide and 500 devices per reel. The reel diameter is 330mm (370mm available on request to meet EIA requirements).



## **NKK** SERIES ND3 ROTARY SWITCHES

#### SURFACE MOUNT/BINARY CODED/DIP ROTARY





#### **SOLDERING & MOUNTING**

Vapor Phase Reflow Soldering: 60 seconds @ 150°C + 60 seconds @ 215°C (120 seconds total)

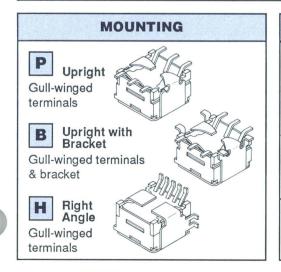
Switches should be left in unheated state at least 10 minutes after soldering before they are washed.

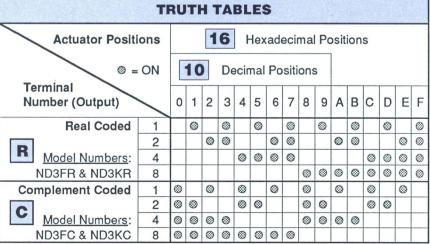
Manual Soldering:

3 seconds @ 350°C or 10 seconds @ 260°C Eutectic solder is recommended.

**Mounting Note:** 

It is recommended that the body of models for upright mounting without bracket be fastened to a panel or similar support for protection of solder joints from mechanical stress.





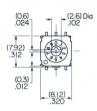
## **NKK®** SERIES ND3 ROTARY SWITCHES

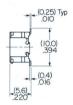
#### SURFACE MOUNT/BINARY CODED/DIP ROTARY



Screwdriver Actuated/Upright Mounting







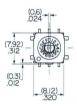


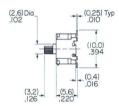
ND3FR10P Model Shown

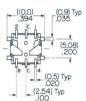


Shaft Actuated/Upright Mounting with Bracket







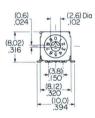


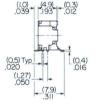
ND3KC16B Model Shown



Screwdriver Actuated/Right Angle Mounting





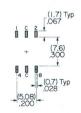




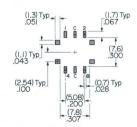
ND3FC10H Model Shown

Pad Layouts for Surface Mount Terminals

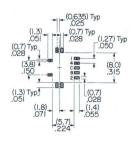
**Upright Mounting** 



Upright Mounting w/Bracket



**Right Angle Mounting** 



# SERIES SS MCRO-SUBMINIATURE SLIDE SWITCHES



## NKK SERIES SS

#### MICRO-SUBMINIATURE/LOGIC LEVEL/PCB MOUNTING

#### **DISTINCTIVE FEATURES**

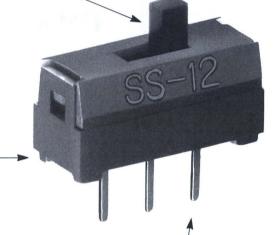
Bright & uniform illumination in models with LED in actuator.

Compact dimensions (.354" maximum width, .622" maximum length & .275" maximum from PCB to top) allow for high density mounting.

Top or side actuation permits \_ flexible board design.

Crisp actuation positively indicates circuit status.

Double molded thermoset base and thermoplastic housing prevent loosening of terminals due to high soldering temperatures.



Sliding twin contact mechanism with self-cleaning action provides smooth actuation and produces high contact reliability.

**Actual Size** 



Insert molded terminals lock out \_\_\_\_\_ flux, solvents, and other contaminants.

Inch or metric terminal spacing for standard PC board grid (.100" X .100" or 2.0mm X 2.0mm).

## **NKK** SERIES SS SLIDE SWITCHES

#### MICRO-SUBMINIATURE/LOGIC LEVEL/PCB MOUNTING

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

0.1A @ 30V DC

Contact Resistance:

20 milliohms maximum

Insulation Resistance:

100 megohms minimum @ 500V DC

Dielectric Strength:

500V AC minimum

Mechanical Life:

10,000 operations minimum

**Electrical Life:** 

10,000 operations minimum

**Total Travel:** 

2.0mm (.079") approximate

**Ambient Temp Range:** 

-15°C through +60°C (+5°F through +140°F)

MATERIALS & FINISHES							
Actuator	Polyamide for 3-on models; polyacetal for all other models						
Upper Case	Polyester for illuminated & 3-on; polyacetal for all other models						
Lower Case	Glass fiber reinforced polyester for illuminated & 3-on models; glass fiber reinforced polybutylene terephthalate (thermoplastic) for all other models						
Movable Contactor	Phosphor bronze with silver plating						
Interior Base	Phenolic resin (thermoset)						
End Contact	Brass with silver plating over copper undercoating						
Terminals	Brass with silver plating over copper undercoating						

#### **APPLICATIONS**

NKK's logic level slide switches are designed with economy and user convenience in mind. The SS Series is specifically constructed for low current circuitry and provides a 0.1A rating. These double throw devices have shorting (make-before-break) contacts and are available in single or double pole models. Top or side actuation may be combined with either inch (.100" X .100") or metric (2.0mm X 2.0mm) PC terminal spacing which conforms to standard PC board grid.

SS Series micro-subminiature switches are especially well suited for use in low energy systems and applications with limited space requirements. Typical applications include: small electronic appliances and games, calculators, portable medical devices, telecommunications equipment and other hand held electronic devices.

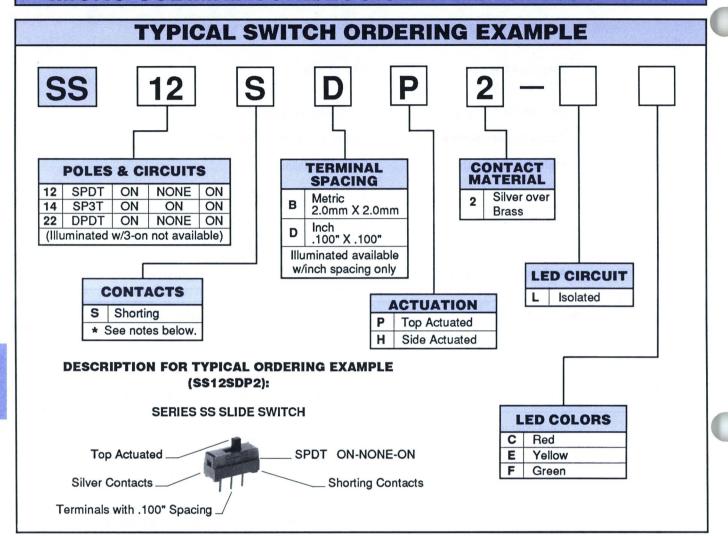






## **NKK®** SERIES SS SLIDE SWITCHES

#### MICRO-SUBMINIATURE/LOGIC LEVEL/PCB MOUNTING



POLES AND CIRCUITS								
SLIDE POSITION & TERMINAL NUMBERS								
POLE &		Up	Center	Down				
THROW								
SPDT	SS12	ON	NONE	ON				
CONNEC		2-1	OPEN	2-3				
SCHEMATIC								
SP3T	SS14	ON	ON	ON				
CONNEC		3-4	3-2	3-1				
SCHEM			4 • 2 • 1					
DPDT	SS22	ON	NONE	ON				
CONNEC		2-1 5-4	OPEN	2-3 5-6				
SCHEMATIC 2 (COMM) 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0								
Terminal r	Terminal numbers are not actually on the switch. * Note: ON-OFF-ON circuit							

#### CONTACTS

S

Shorting (Make-before-break) See note below.

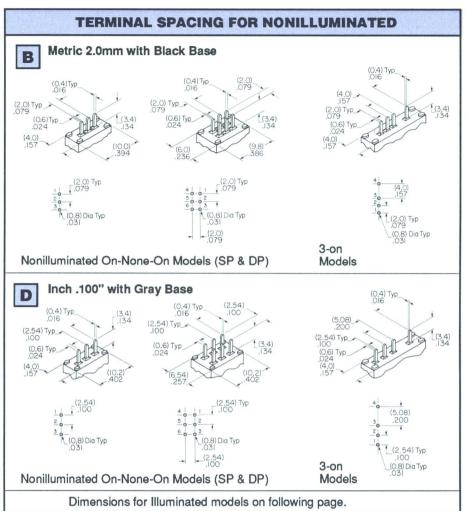
SS series slide switches employ a twin contact mechanism in which two movable contacts slide along the stationary contacts to provide excellent contact stability and increased operating life. Contact reliability is assured since the contacts are wiped clean with each actuation.

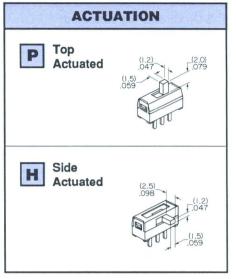
The shorting contact feature means that in this double throw switch one circuit is completed before the other is interrupted.

\* Note: Switching between terminals 4 and 2 is nonshorting and between terminals 2 and 1 is shorting, thus giving the option of creating an ON-OFF-ON circuit.

can be created by not connecting terminal 2 of the SS14 model.

## **NKK** SERIES SS SLIDE SWITCHES





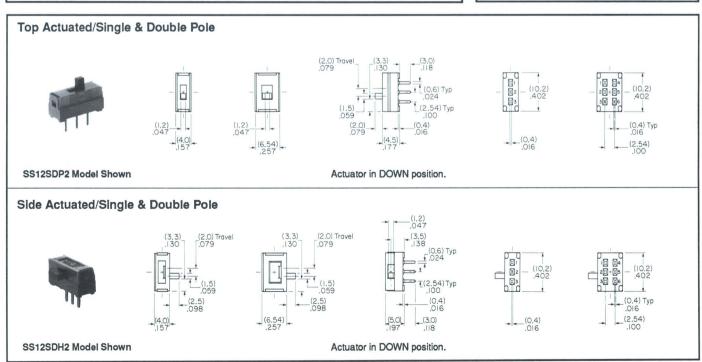


Silver over Brass Rated 0.1A @ 30V DC

#### **SOLDERING LIMITS**

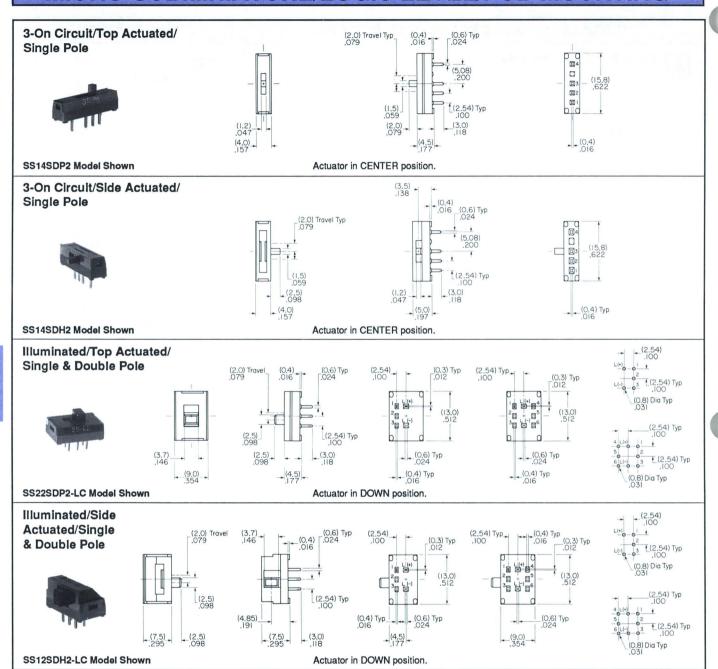
3 seconds @ 350°C 5 seconds @ 270°C

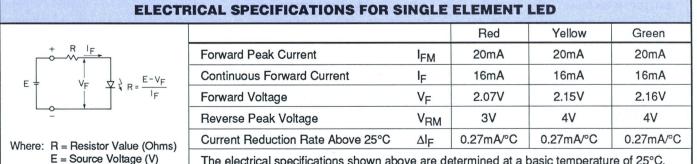
5 seconds @ 250°C for plated-through holes



## **NKK** SERIES SS SLIDE SWITCHES

#### MICRO-SUBMINIATURE/LOGIC LEVEL/PCB MOUNTING





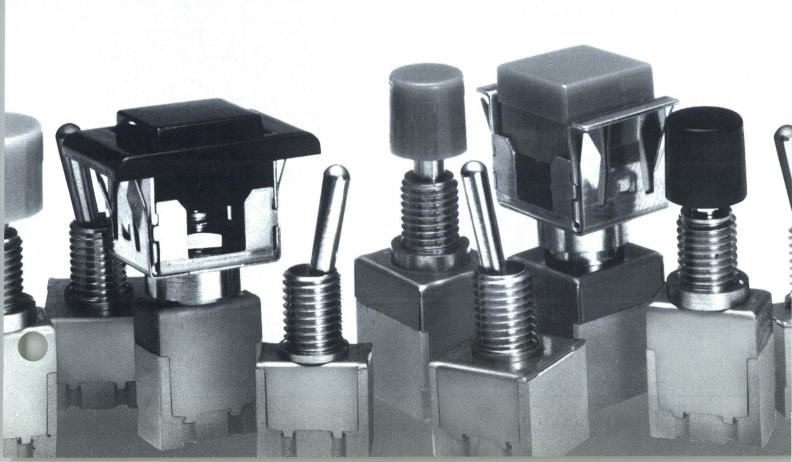
The electrical specifications shown above are determined at a basic temperature of 25°C. If the source voltage exceeds the LED's rated voltage, the required ballast resistor value can be calculated by using the accompanying formula.

V<sub>F</sub> = Forward Voltage (V) I<sub>F</sub> = Forward Current (mA)

# SERIES E

# 3 AMP SUBMINIATURE SWITCHES

• TOGGLES • PUSHBUTTONS



## NKK® SERIES E

#### SUBMINIATURE/LIGHT DUTY/PANEL MOUNTABLE

#### **DISTINCTIVE FEATURES**

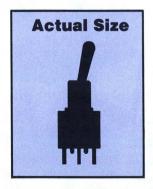
3 amp rating for AC makes E Series devices suited to light duty applications.

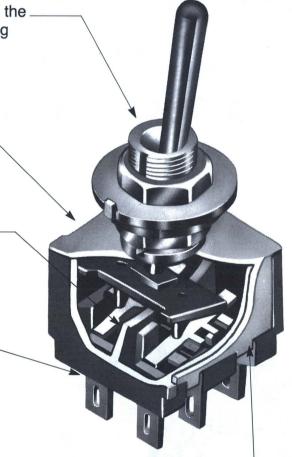
The high torque bushing prevents the bushing from rotating or separating from the metal frame during installation.

The stainless steel frame resists corrosion.

Insulating barriers, higher than standard, protect against crossover in multipole devices.

Epoxy sealed terminals prevent entry of solder flux and other contaminants.





1500V dielectric strength \_\_\_\_\_\_ between contacts and case is accomplished by clinching the frame away from the terminals.

## NKK® SERIESE

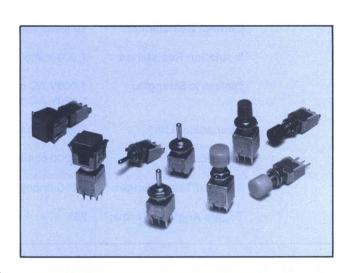
#### SUBMINIATURE/LIGHT DUTY/PANEL MOUNTABLE

#### **APPLICATIONS**

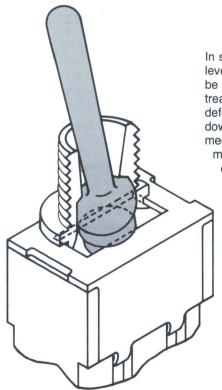
#### TogglesPushbuttons

The E Series toggle switches combine maximum performance characteristics with small size and light weight. The small size is ideal for miniaturized equipment with space limitations. The toggles have a slow-make, slow-break contact mechanism and are suited for AC applications. The pushbutton models offer extremely light operation and a variety of decorative accessories.

The majority of circuits in both single and double pole devices have UL recognition. In most circuits of the single pole solder lug devices and the single and double pole PC models, CSA certification applies. For exact model numbers see the UL and CSA tables contained in the supplement at the end of this catalog.



#### **ANTIJAMMING DESIGN**



In some applications where a lever may suffer sharp blows or be subjected to other harsh treatment, contacts can be deformed by the transmission of downward force to the contact mechanism. Protection against mechanism damage is

designed into the E Series toggle switches.

Beneath the toggle joint is a step which rests against the frame of the switch. When downward force is applied to the lever, the frame and step resist movement of the lever and protect the contact mechanism.

#### **TOGGLES**

Internal construction prevents switch failure due to biased lever movement

Solder lug and PC terminals

Single pole and double pole in 5 most widely used circuits

Bat lever and threaded metric bushing only

Minimal contact bounce

#### **PUSHBUTTONS**

Extremely light operation with positive detent

Single pole or double pole momentary and alternate action circuits

Bushing or snap-in mounting

Adjustable button height with snap-in mounter

Solder lug and PC terminals

Minimal contact bounce

## **NKK** SERIES E TOGGLE SWITCHES

#### SUBMINIATURE/LIGHT DUTY/PANEL MOUNTABLE

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

**Contact Resistance:** 

3A @ 125V AC for silver contacts

(Resistive Load)

10 milliohms max for silver

Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1,500V AC minimum between contacts & case

Mechanical Life:

100,000 operations minimum

Electrical Life:

20,000 operations minimum for silver

Ambient Temp Range:

-10°C through +85°C (+14°F through +185°F)

Toggle Angle of Throw: 25°

NOMINAL O	NOMINAL OPERATING FORCE IN GRAMS							
	Momentary	Alternate						
E2011		160						
E2012		170						
E2013		460						
E2015	390							
E2018	390							
E2019	490	400						
E2022		200						
E2023		540						
E2025	410							
E2028	620							
E2029	510	600						

MATERIALS & FINISHES						
Toggle	Brass with chrome plating					
Bushing	Brass with nickel plating					
Case	Diallyphthalate resin					
Frame	Stainless steel					
Movable Contacts	Copper with silver					
Stationary Contacts	Silver with silver plating					
Terminals	Copper with silver plating					

#### **BIAS GUARD**

When the lever is pushed in a diagonal direction instead of the mechanism's direction of operation, the biased movement is transmitted to the actuator block and causes misalignment of the contacts. However, internal construction of the E Series case prevents this biased movement.

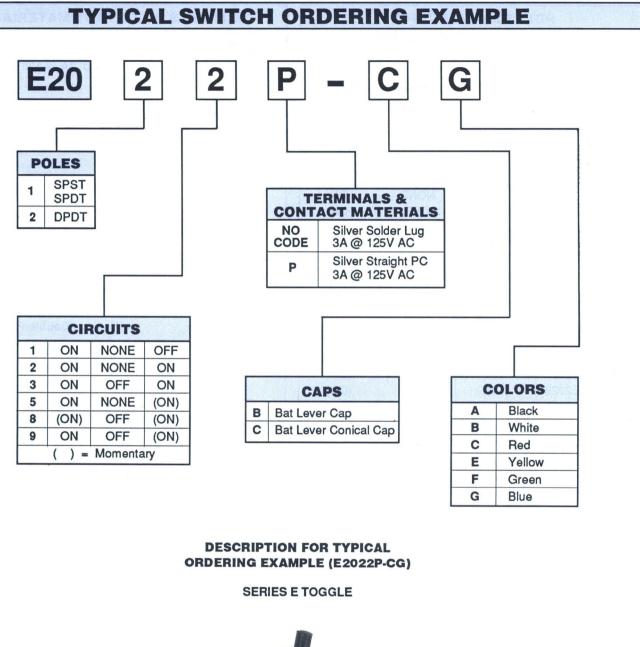
#### **DIELECTRIC STRENGTH**



The superior dielectric strength found in NKK's miniature switches is an accomplishment supporting the unchanging goal to build switches of the highest quality. The 1500V dielectric strength between contacts and case is achieved by clinching the frame to the case well above the base and terminals.

## **NKK** SERIES E TOGGLE SWITCHES

#### SUBMINIATURE/LIGHT DUTY/PANEL MOUNTABLE



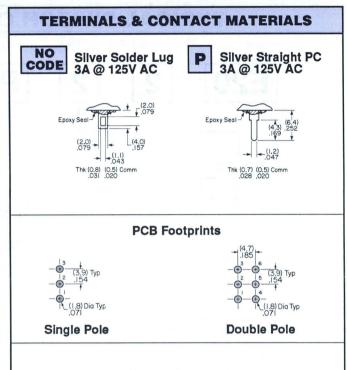




## **SERIES E TOGGLE SWITCHES**



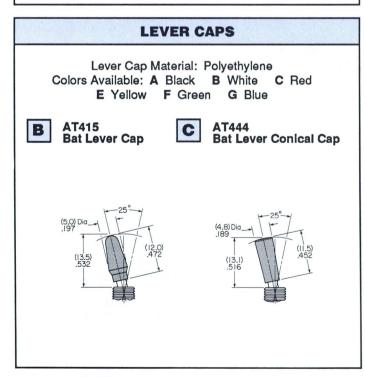
		TOGGLE POSITION & TERMINAL NUMBER (Momentary)		
POLE &	MODEL	Down	Center	Up
SPST	E2011	ON	NONE	OFF
CONNECTED TERMINALS		2-3	OPEN	OPEN
SCHEMATIC		92 (COMM) •3		
SPDT	E2012 E2013 E2015 E2018 E2019	ON ON ON (ON) ON	NONE OFF NONE OFF	ON ON (ON) (ON)
CONNECTED TERMINALS		2-3	OPEN	2-1
SCHEMATIC		9.2 (COMM) 1.9 9.3		
DPDT	E2022 E2023 E2025 E2028 E2029	ON ON ON (ON) ON	NONE OFF NONE OFF	ON ON (ON) (ON) (ON)
CONNECTED TERMINALS		2-3 5-6	OPEN	2-1 5-4
SCHEM	ATIC		2 (COMM) 59	•6

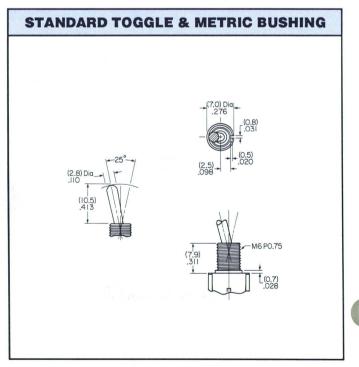


#### Wiring & Soldering

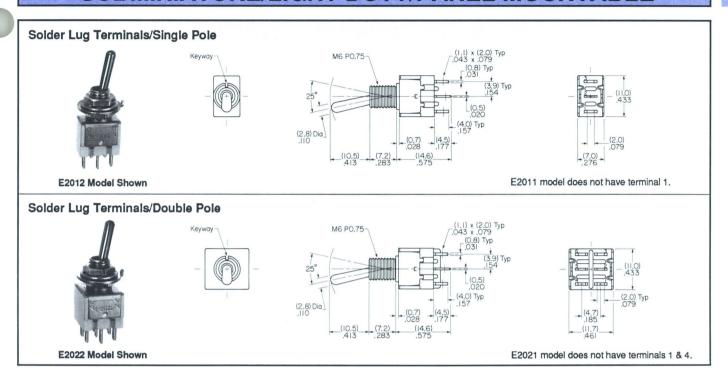
The 0.79" X 0.43" oval hole accommodates 1 solid 18-gauge or 2 solid or stranded 20-gauge wires.

> Soldering Limits: 3 seconds @ 350°C 5 seconds @ 270°C.



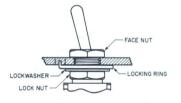


## **SERIES E TOGGLE SWITCHES**





AT513M Metric Hexagon Nut AT507M Metric Locking Ring AT509 Internal Tooth Lockwasher



Optional Hardware Available: Knurled nuts, dress nuts, ON-OFF plates, & waterproof boot

#### **PANEL THICKNESSES & PANEL CUTOUTS**

Hardware:

**Maximum Effective** Panel Thickness:

**Cutout:** 

Hardware: Maximum Effective Panel Thickness:

W/Standard Hardware

2.2mm (.087")

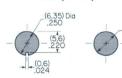


Without Bottom Hex Nut

3.9mm (.154")

Without **Locking Ring** 

3.0mm (.118")



Without Locking Ring & Bottom Hex Nut

(6.35) Dia

4.7mm (.185")

## **NKK** SERIES E PUSHBUTTON SWITCHES

#### LIGHT TOUCH/MOMENTARY & ALTERNATE ACTION

#### **GENERAL SPECIFICATIONS**

Electrical Capacity:

3A @ 125V AC

(Resistive Load)

10 milliohms maximum

Contact Resistance:
Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1,500V AC minimum between contacts & case

Mechanical Life:

100,000 operations minimum

Electrical Life:

25,000 operations minimum

Ambient Temp Range:

-10°C through +85°C (+14°F through +185°F)

Average Pretravel:

0.47mm (.019") for Momentary 1.5mm (.059") for Alternate Action

Average Overtravel:

1.13mm (.044") for Momentary 0.7mm (.028") for Alternate Action

Average Total Travel:

1.6mm (.063") for Momentary 2.2mm (.087") for Alternate Action

**Nominal Operating Force:** 

EB2011 240 grams

EB2061 300 grams

EB2065 270 grams

EB2085 370 grams

MATERIALS AND FINISHES				
Plunger (Momentary)	Brass with chrome plating			
Plunger (Alternate)	Brass with nickel plating			
Bushing	Brass with nickel plating			
Case	Diallylphthalate resin			
Frame	Stainless steel			
Snap-in Frame	Stainless steel			
Movable Contacts	Copper with silver			
Stationary Contacts	Silver with silver			
Terminals	Copper with silver			

#### **BUSHING MOUNTED**



The appearance of the bushing mounted push-buttons can be varied by the use of either a small or large cap in 7 color selections or by the use of optional mounting collars.

#### **SNAP-IN MOUNTED**

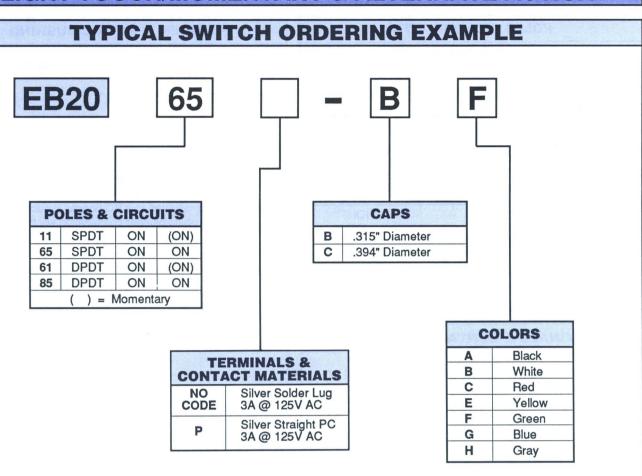


The snap-in mounted pushbutton is offered with 6 cap colors, variation in cap rise, and 4 bezel types in various colors.



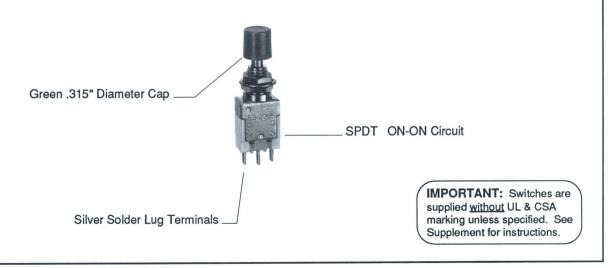
## **SERIES E PUSHBUTTON SWITCHES**

#### LIGHT TOUCH/MOMENTARY & ALTERNATE ACTION



## DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (EB2065-BF)

**SERIES E PUSHBUTTON** 





## KK SERIES E PUSHBUTTON SWITCHES

### LIGHT TOUCH/MOMENTARY & ALTERNATE ACTION

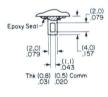
	PO	LES AND CIRC	CUITS	
	MODEL	PLUNGER POSITION & TERMINAL NUMBERS (Momentary)		
POLE & THROW		Normal	Down	
SPDT	EB2011 EB2065	ON ON	(ON) ON	
CONNECTED TERMINALS		2-3	2-1	
SCHEM	ATIC	1•/	92 (COMM) •3	
DPDT	EB2061 EB2085	ON ON	(ON) ON	
CONNECTED TERMINALS		2-3 5-6	2-1 5-4	
SCHEMATIC		92 (COMM) 59 93 40 66		

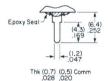
#### **TERMINALS & CONTACT MATERIALS**

Silver Solder Lug CODE 3A @ 125V AC



Silver Straight PC 3A @ 125V AC





#### **PCB Footprints**





Single Pole

**Double Pole** 

#### **WIRING & SOLDERING**

The 0.79" X 0.43" oval hole accommodates 1 solid 18-gauge or 2 solid or stranded 20-gauge wires.

Soldering Limits: 3 sec. @ 350°C; 5 sec. @ 270°C.

#### **PLUNGER & METRIC BUSHING**

#### Momentary

#### Alternate Action

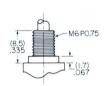




Contact factory when ordering both momentary and alternate action devices which are to be combined in a panel and mounted to a PC board. In such a case, a special bushing/plunger combination will be provided to achieve uniform cap height.



Metric Bushina

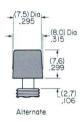


#### **PLUNGER CAPS**

Cap Material: Polycarbonate Colors Available: A Black B White E Yellow F Green G Blue H C Red H Gray

AT443 .315" Dia. Snap-on Cap B



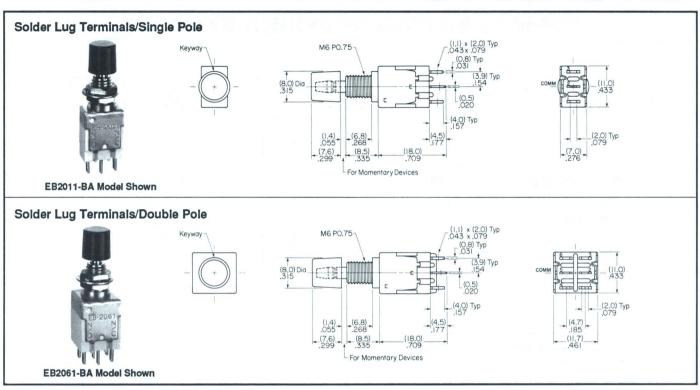


AT442 .394" Dia. Snap-on Cap

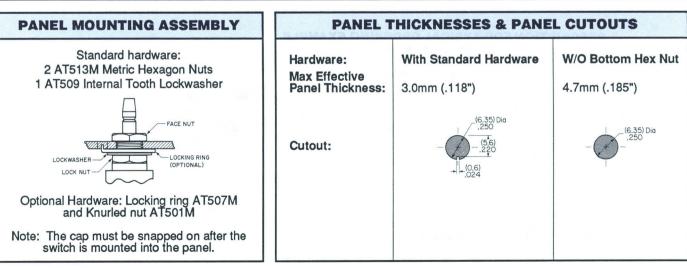




#### LIGHT TOUCH/MOMENTARY & ALTERNATE ACTION

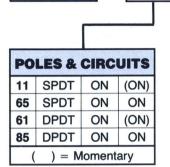






#### SNAP-IN/LIGHT TOUCH/MOMENTARY & ALTERNATE





**EB20** 

T	ERMINALS
NO CODE	Silver Solder Lug 3A @ 125V AC
Р	Silver Straight PC 3A @ 125V AC

CA	P COLORS					
Α	Black					
В	White					
С	Red					
E	Yellow					
F	Green					
G	Blue					

В

Α	Black					
В	White					
С	Red					
E	Yellow					
F	Green					
G	Blue					
Н	Gray					
	zels for J22, J23,					
	4, J32, J33, J34,					
J44	2, J43, J44, J52,					

J53, & J54 available

in black only.

LED COLORS					
С	Red				
CF	Red/Green				
CE	Red/Yellow				
CC	Red/Red				
FE	Green/Yellow				
FF	Green/Green				
EE	Yellow/Yellow				

#### Momen-Altertary Description nate **Low Rise J20 J30** Without Bezel **J21 J31** Bezel without LED **J32** Bezel W/1 Round LED **J22** J23 **J33** Bezel W/2 Round LEDs **J24 J34** Bezel W/2 Rectangular LEDs **High Rise** J40 J50 Without Bezel J41 **J51** Bezel without LED J42 **J52** Bezel W/1 Round LED J43 **J53** Bezel W/2 Round LEDs **J44 J54** Bezel W/2 Rectangular LEDs

**SNAP-IN MOUNTER & CAP** 

#### **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE** (EB2011P-J23B-AFE):

SERIES EB SNAP-IN PUSHBUTTON

**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

Black Bezel with Round LEDs 1 Green and 1 Yellow

> SPDT ON-(ON) Circuit

Note: See previous pushbutton section for applicable general specifications and for materials and finishes.

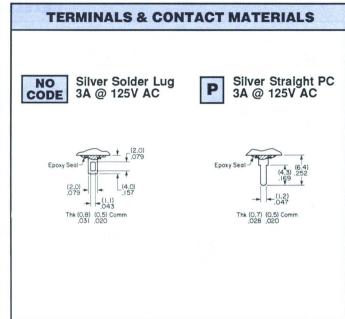


Silver Straight **PC Terminals** 



#### LIGHT TOUCH/MOMENTARY & ALTERNATE ACTION

		PLUNGER POSITION	& TERMINAL NUMBERS		
		(Mor	nentary)		
POLE & THROW	MODEL	Normal	Down		
SPDT	EB2011 EB2065	ON ON	(ON) ON		
CONNEC		2-3	2-1		
SCHEM	ATIC	3 ♠	● 2 (COMM) ● I		
DPDT	EB2061 EB2085	ON ON	(ON) ON		
CONNEC		2-3 5-6	2-1 5-4		
SCHEMATIC 3. (COMM) 5.9					



#### **SNAP-IN MOUNTER AND SNAP-ON CAP**

The square, snap-on cap and snap-in mounter are factory assembled on the switch. From the following table, the customer must select the desired dimension and code for cap extension. Cap extension varies according to the choice of momentary or alternate action circuits and the use of a bezel. In addition, a variety of cap, bezel, and LED colors are available. Details of the fully assembled switch with mounter and cap are shown in the dimensioned drawings at the end of this pushbutton section.

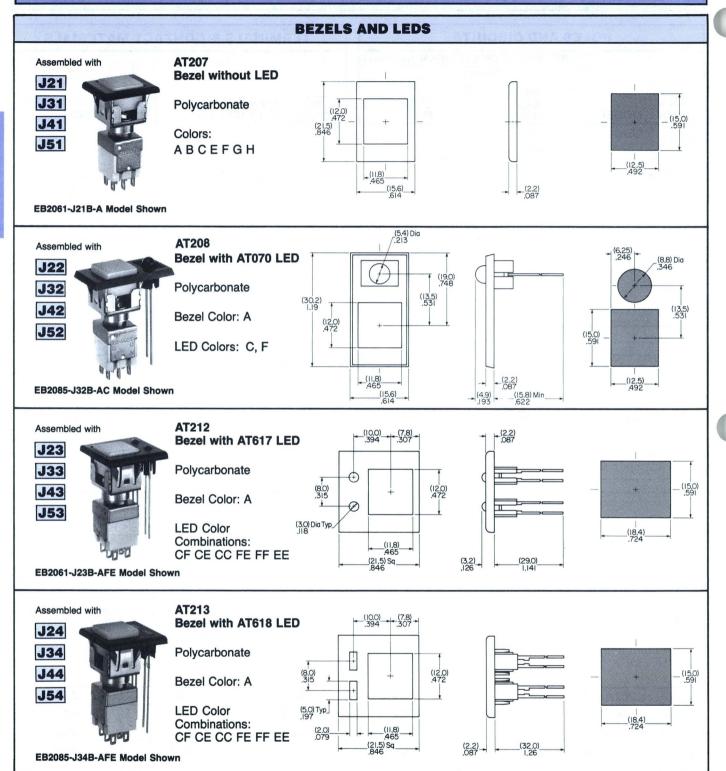
Cap Material: Polycarbonate

Standard Cap Finish: Shiny Contact factory for matte finish.

Colors Available: A Black B White C Red E Yellow F Green G Blue

DIN	MENSIONS FOR	CAP EXTENSION	<b>4</b> - 2 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3		
	LOW	RISE	HIGH RISE		
CAP/MOUNTER DESCRIPTION	Momentary	Alternate Action*	Momentary	Alternate Action*	
Without Bezel	J20 (2.2) .087 (11.0) .433 (2.8) .177 .110	J30 (3.3) ,130 (11.0) ,433 ,433 (4.5) ,110	J40 (3.3) 1.150 (11.0) (13.4) (12.8) (13.4) (10.1) (10.1)	J50 (4.4) [173] (110) (110) (433) (3,4) (3,4) (134)	
With Bezel Without LED	J21	J31	J41	J51	
With Bezel With 1 Round LED	J22	J32	J42	J52	
With Bezel With 2 Round LEDs	J23	J33	J43	J53	
With Bezel With 2 Rectangular LEDs	J24	J34	J44	J54	
*Note: When alternate action and momentary devices are combined on a panel where the same dimension for cap extension is desired, order both switches with the same J code. Example: EB2011-J52B-AC and EB2065-J52B-AC. Both types of devices will then be the alternate action height shown here.	(1.0) (2.2) (0.0) (3.394 (4.5) (4.5) (1.77)	(2.1) .083 (2.2) .087 (00) .394 (4.5) .110	(2.1) .083 .(2.2) .087 .087 .094 .394 .110	(3.2) [.26] (10.0) (10.0) (3.4) [.3.4) [.3.4)	

#### SNAP-IN/LIGHT TOUCH/MOMENTARY & ALTERNATE



	BEZEL COLOR CODES					100	LED COL	OR C	ODES		
A	Black Yellow	_	White Green		Red Blue	н	Gray	C F CF	Red Green Red/Green	FE	Red/Red Green/Yellow Green/Green
Standard	finish is s	hiny	. Contact	the	factory	/ foi	r matte finish.		Red/Yellow		Yellow/Yellow

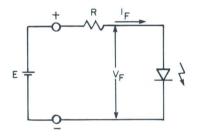
#### SNAP-IN/LIGHT TOUCH/MOMENTARY & ALTERNATE

LED LAMP SPECIFICATIONS									
		АТ	AT070 AT617				AT618		
Color Code		С	F	С	E	F	С	E	F
Lamp Color		Red	Green	Red	Yellow	Green	Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	25mA	30mA	30mA	20mA	30mA	10mA	20mA	30mA
Continuous Forward Current	I <sub>F</sub>	20mA	20mA	24mA	16mA	24mA	8mA	16mA	24mA
Forward Voltage	V <sub>F</sub>	2.8V	2.2V	2.01V	1.96V	1.95V	1.9V	1.9V	2.0V
Reverse Peak Voltage	V <sub>RM</sub>	4V	4V	5V	4V	5V	5V	4V	5V
Current Reduction Rate Above 25°C	$\Delta l_{_{\rm F}}$	0.33 mA/°C	0.40 mA/°C	0.40 mA/°C	0.27 mA/°C	0.40 mA/°C	0.13 mA/°C	0.27 mA/°C	0.40 mA/°C
Ambient Temperature Range (in bezel)		-10°C ~ +70°C		-15°C ~ +70°C		-15°C ~ +70°C			

The electrical specifications shown above are determined at a basic temperature of 25°C.

#### **USE OF BALLAST RESISTOR**

If the source voltage is greater than the rated voltage of the lamp or LED, a ballast resistor must be connected in series with the lamp. The circuit diagram and formula will assist in calculating the value of the required ballast resistor.



 $R = \frac{E - V_F}{I_F}$ Where E = Source Voltage R = Resistor Value (Ohms)  $V_F = Forward Voltage (V)$ 

I<sub>F</sub> = Current (mA)

For additional information, see table of lamp resistor values at the end of the catalog.

#### **WIRING SPECS**

Solder lug terminals have a .079" x .043" oval hole which accommodates 1 solid or stranded 18-gauge wire, or 2 solid or stranded 20-gauge wires.

#### **SOLDERING LIMITS**

3 seconds at 350°C

5 seconds at 270°C

#### **MAXIMUM EFFECTIVE PANEL THICKNESS**

With Bezel 1.0mm  $\sim$  3.2mm (.039"  $\sim$  .126") Without Bezel 1.0mm  $\sim$  4.0mm (.039"  $\sim$  .157")

#### **PCB FOOTPRINTS**

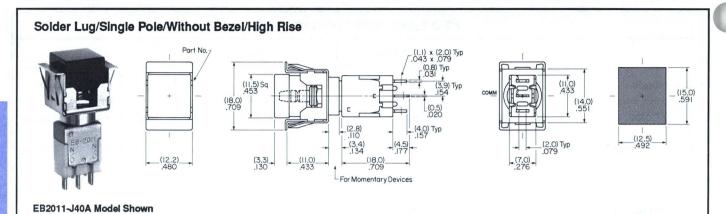
Single Pole



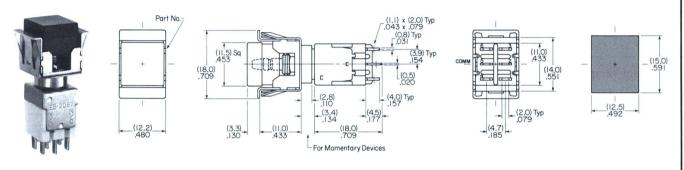
**Double Pole** 



#### LIGHT TOUCH/MOMENTARY & ALTERNATE

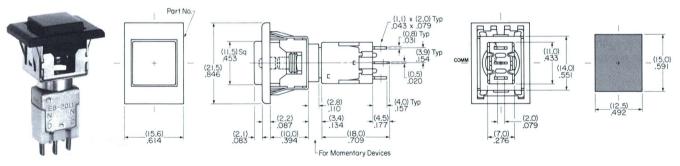


#### Solder Lug/Double Pole/Without Bezel/High Rise



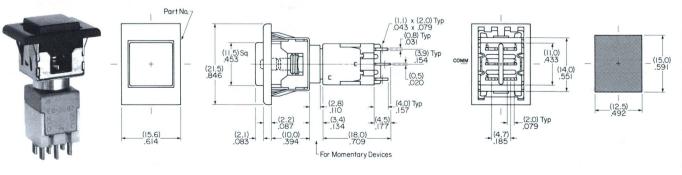
EB2061-J40A Model Shown

#### Solder Lug/Single Pole/With Bezel/High Rise



EB2011-J41B-A Model Shown

#### Solder Lug/Double Pole/With Bezel/High Rise



EB2061-J41B-A Model Shown

# SERIES SB & FB

SUBMINIATURE & SUPER-SUBMINIATURE PUSHBUTTON SWITCHES



# NKK SERIES SB

#### SUBMINIATURE/3 AMP RATED/BUSHING MOUNT

#### **DISTINCTIVE FEATURES**

Optional slip-on caps in seven colors to vary appearance as needed.

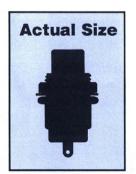
Easy actuation due to low operating force.

Low cost device of rugged, one-piece bushing \_ and housing construction.

Rear panel bushing mounting with compact \_ behind panel dimension.

Internal antijamming feature to protect the \_\_\_\_ contacts from damage due to excessive force on the plunger.

Reliability of construction with an internal guide to maintain contact alignment.



3 amp rating with silver contacts standard.

Epoxy sealed terminals with normally open circuits.





#### **SERIES SB PUSHBUTTON SWITCHES**

#### SUBMINIATURE/3 AMP RATED/BUSHING MOUNT

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: 3A @ 125V AC or 2A @ 30V DC for silver

(Resistive Load) 0.4VA maximum @ 28V AC/DC maximum for gold

(Applicable Range 0.1mA ~ 0.1A @ 20mv ~ 28V)

Contact Resistance: 10 milliohms maximum for silver

20 milliohms maximum for gold

Insulation Resistance: 200 megohms minimum @ 500V DC

Dielectric Strength: 1,000V AC minimum between contacts and

between contacts and case

Mechanical Life: 30,000 operations minimum

Electrical Life: 10,000 operations minimum

Ambient Temp Range: -10°C through +70°C (+14°F through 158°F)

SB4011NO SB4011NC

 Pretravel:
 0.79mm (.031")
 0.64mm (.025")

 Overtravel:
 1.45mm (.057")
 1.60mm (.063)

 Total Travel:
 2.24mm (.088")
 2.24mm (.088")

Nominal Operating Force: 500 grams

#### **APPLICATIONS**

Series SB subminiature pushbuttons offer a low cost option for users of switches in communication equipment, machinery, security devices, and other applications. The small behind panel dimension, availability of two plunger colors, momentary function with normally open or normally closed contacts, epoxy seal on normally open models, and an optional cap all give the customer selections to suit a variety of needs.

#### **UL & CSA**

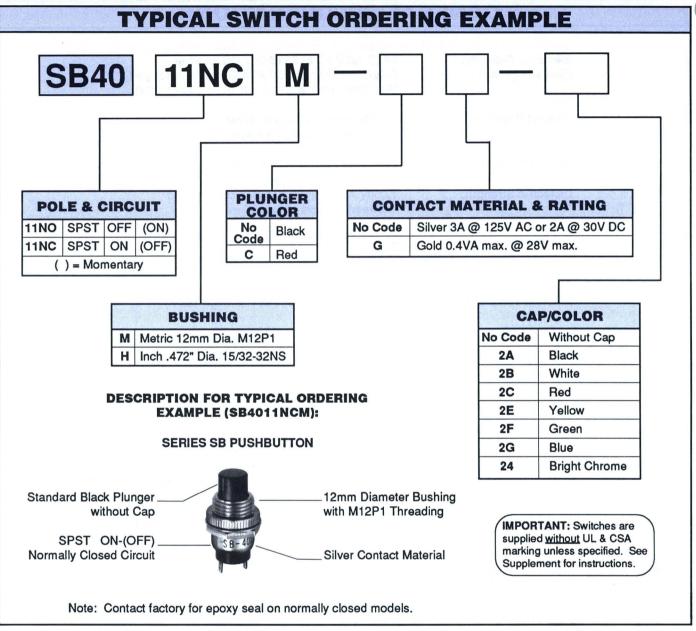
The models recognized by Underwriters Laboratories Inc. under the File Number E44145 are those rated 3A @ 125V AC.

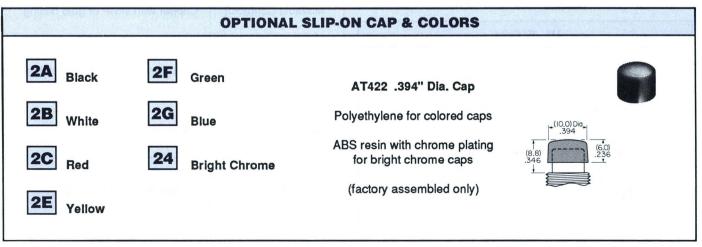
The models certified by Canadian Standards Association are those rated 3A @ 125V AC and 2A @ 250V AC. NKK's File Numbers at CSA are LR23535 and LR56017.

MATERIA	ALS AND FINISHES
Plunger	Phenolic resin
Bushing/Housing	Brass with nickel plating
Movable Contactor	Copper with silver or gold plating
Stationary Contacts	Copper with silver or gold plating
Case	Phenolic resin
Terminals	Copper with silver plating



#### SUBMINIATURE/3 AMP RATED/BUSHING MOUNT







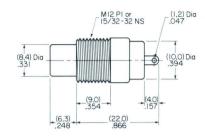
#### **SERIES SB PUSHBUTTON SWITCHES**

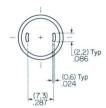
#### SUBMINIATURE/3 AMP RATED/BUSHING MOUNT

#### SB4011NO/Solder Lug/Single Pole









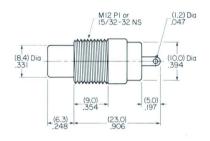
SB4011NOM Model Shown

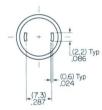
Supplied with epoxy sealed terminals.

#### SB4011NC/Solder Lug/Single Pole









SB4011NCM Model Shown

#### **PANEL THICKNESS & CUTOUT**

Panel Thickness:

4mm (.157") maximum

Panel Cutout:



#### STANDARD HARDWARE

Hardware provided with each switch:

<u>Metric</u>

1 Knurled Face Nut AT504

Inch 2 Hex Mounting Nuts AT527H

1 Lockwasher AT508

1 Lockwasher AT508

1 Hex Mounting Nut

AT527M

Dimension drawings in hardware section at end of this catalog give further detail.

#### **SOLDERING & WIRING**

3 seconds at 350°C 5 seconds at 270°C

The .047" diameter hole in SB4011 accommodates one solid 18-gauge wire.

#### SUPER-SUBMINIATURE/MOMENTARY/PANEL MOUNT

#### **APPLICATIONS**

NKK'S super-subminiature FB Series single pole switch features a 5mm (.197") diameter bushing and total switch length of less than 1 inch (.819"). These dimensions enhance the user's efficient use of space. The FB switch with its .100" terminal spacing and epoxy sealed terminals is also suitable for PC board mounting.

With ratings of 500mA @ 125V AC and 0.4VA @ 28V AC/DC, these momentary. normally open devices are designed for reliability and longevity. FB switches are guaranteed for a minimum of 50,000 electrical and 50,000 mechanical operations. The one-piece bushing and housing construction prevents separation during installation.

#### **UL RECOGNITION**

FB models rated at 500mA are recognized by Underwriters Laboratories Inc.

The UL File Number is E44145.

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** (Resistive Load)

500mA @ 125V AC for silver contacts 0.4VA maximum @ 28V AC/DC maximum

for gold contacts (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance: 30 milliohms maximum

Insulation Resistance: 100 megohms minimum @ 500V DC

Dielectric Strength: 1.000V AC minimum

Mechanical Life: 50,000 operations minimum

**Electrical Life:** 50,000 operations minimum

**Ambient Temp Range:** -10°C through +70°C (+14°F through 158°F)

Pretravel: 1.1mm (.043")

Overtravel: 0.57mm (.022")

**Total Travel:** 1.67mm (.065")

**Operating Force:** 220 grams average

MATERIALS AND FINISHES							
Plunger	Polyacetal						
Bushing/Housing	Brass with nickel plating						
Movable Contact	Brass with silver or gold plating						
Case	Phenolic resin						
Stationary Terminals	Phosphor bronze with silver or gold plating						

#### **ACTUAL SIZE**

Total Length: 20.8mm .819"

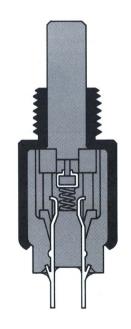
Behind Panel: 11.8mm .465"



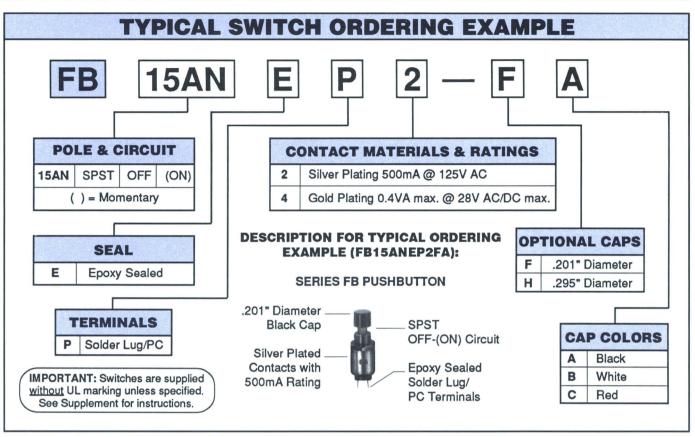
#### **CONTACT MECHANISM**

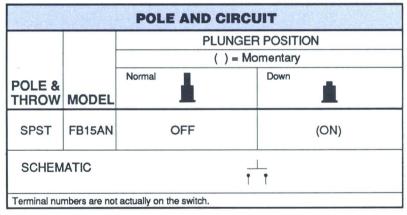
The FB switch is available in a single pole single throw, normally open (NO) circuit with momentary contact. The switch is designed so that the contact points are cleaned during every switching motion. This selfcleaning feature results in high contact reliability without compromising the switch's high mechanical stability.

The movable contactor slides between the flexible stationary contacts when the plunger is pressed. The one-piece terminal and stationary contact construction minimizes contact resistance and prevents premature failure.

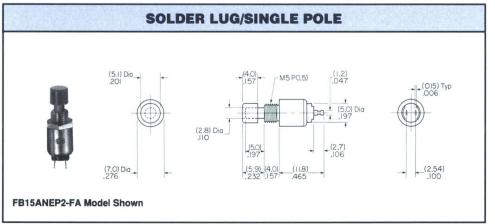


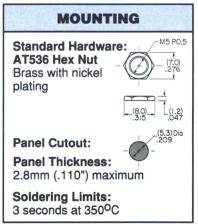
#### SUPER-SUBMINIATURE/MOMENTARY/PANEL MOUNT

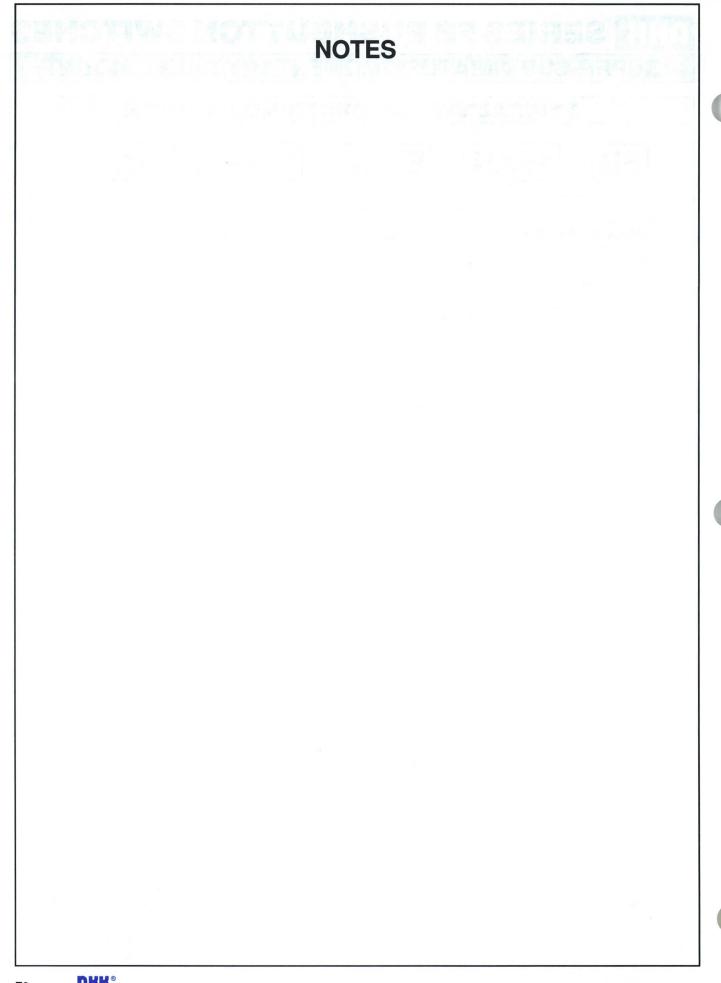








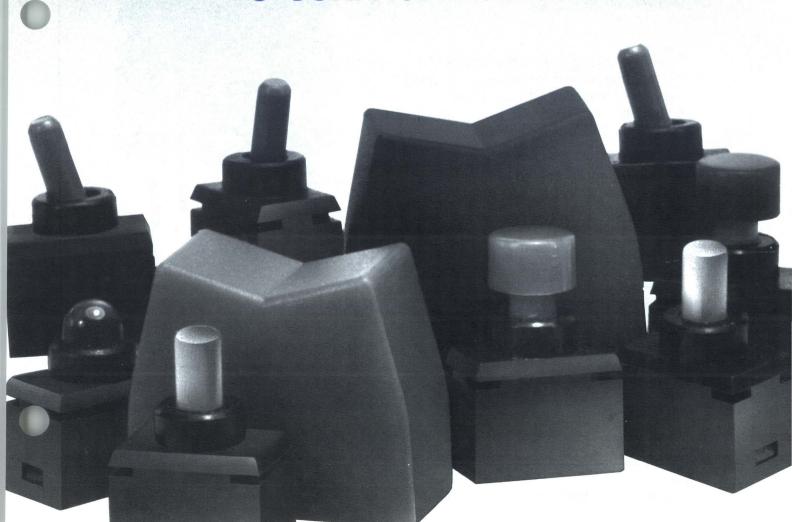




# SERIES G MICRO-SUBMINIATURE SMITCHES

- TOGGLES ROCKERS
- PUSHBUTTONS INDICATORS

  - **SURFACE MOUNT**



# NKK SERIES G

#### MICRO-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

#### **DISTINCTIVE FEATURES**



Micro-subminiature size (1/3 the volume of supersubminiatures) allows for high density mounting, and extremely light weight of 0.25 grams makes this device suited for use in handheld equipment.

The use of antistatic resin for the \_ housing, base, and lever prevents static electricity charges from reaching the contacts.

Totally sealed body prevents contact \_\_\_\_ contamination and allows time- and money-saving automated wave soldering and washing.

Patented Sliding Twin Crossbar (STC) \_ contact mechanism provides unequalled logic-level reliability and smoother actuation.

Molded-in, epoxy sealed terminals lock out flux, solvents, and other contaminants.

Actual Size

.100" X .100" terminal spacing conforms to standard PC board grid spacing. Round terminals facilitate easier mounting on PC boards.

# **NKK** SERIES G SWITCHES

#### MICRO-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

0.4VA maximum @ 28V AC/DC maximum (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V) (Resistive Load)

Contact Resistance: 80 milliohms maximum

Insulation Resistance: 500 megohms minimum @ 500V DC

Dielectric Strength: 500V AC minimum

Mechanical Life: 100,000 operations minimum for ON-NONE-ON & ON-OFF-ON

50,000 operations minimum for other circuits

**Electrical Life:** 100,000 operations minimum for ON-NONE-ON & ON-OFF-ON

50,000 operations minimum for other circuits

**Ambient Temp Range:** -25°C through +70°C (-13°F through +158°F)

Toggle Angle of Throw:

**Pushbutton Travel:** Pretravel 0.9mm (.035") Overtravel 0.2mm (.008") Total 1.1mm (.043")

**Contact Bounce:** 1 millisecond

Toggles: 95g (momentary); 122g (maintained) Rockers: 83g (momentary); 108g (maintained) Pushbuttons: 200g **Nominal Operating Force:** 

Soldering Limits: 3 seconds @ 350°C or 5 seconds @ 270°C

MATERIALS & FINISHES					
Actuator	Glass fiber reinforced polyamide for toggles & rockers; polyacetal for pushbuttons				
Case	Glass fiber reinforced polyamide				
Sealing Rings	Nitrile butadiene rubber				
Movable Contact	Phosphor bronze with gold plating over nickel				
Stationary Contacts	Phosphor bronze with gold plating over nickel				
Base	Glass fiber reinforced polyamide				
Terminals	Phosphor bronze with gold plating over nickel				

#### STC CONTACT MECHANISM



NKK's patented, award-winning Sliding Twin Crossbar (STC) contact mechanism offers benefits unavailable in conventional mechanisms. For

example, movable twin contact surfaces pinch the stationary contacts to provide increased contact stability and unparalleled logic-level reliability. Continued reliability is assured since the gold-plated contacts are wiped clean with each actuation. Furthermore, if one side of the twin contacts should fail to conduct, the other side functions as a backup, or fail-safe path for the current. The combination of rounded movable and stationary contacts provides smooth contact feel previously unavailable in sliding contact type mechanisms.

RELATIVE SIZE COMPARISON

#### WASHABILITY

A combination of design features makes the G Series switches totally sealed: 1) The bushing and housing are one molded piece. 2) Rubber

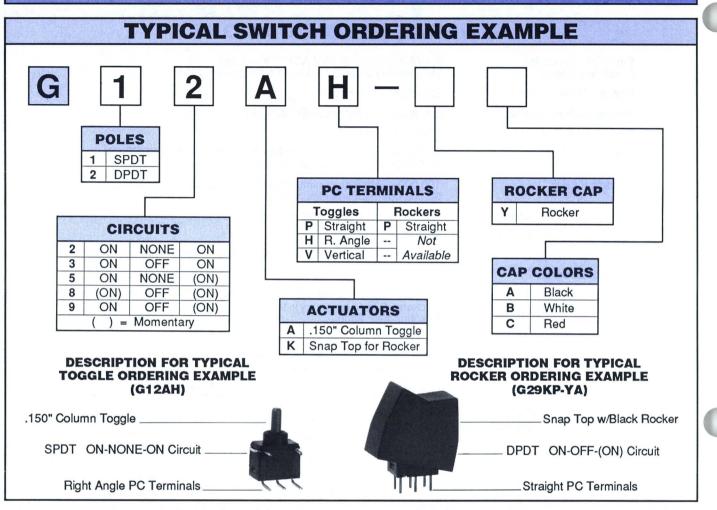
rings surround the actuator and the base where it fits into the housing. 3) Terminals are molded into the base and epoxy sealed. These features allow time- and money-saving automated soldering techniques and safe washing with alcohol base cleaning solvents.



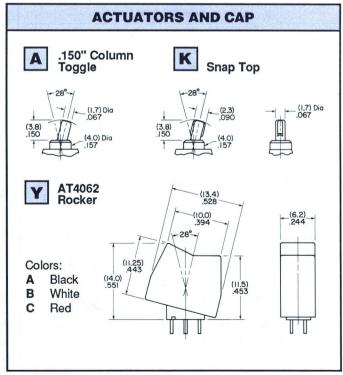
# Subminiature Super-Subminiature Micro-Subminiature

## **NKK** SERIES G TOGGLES & ROCKERS

#### MICRO-SUBMINIATURE/PCB/ANTISTAT

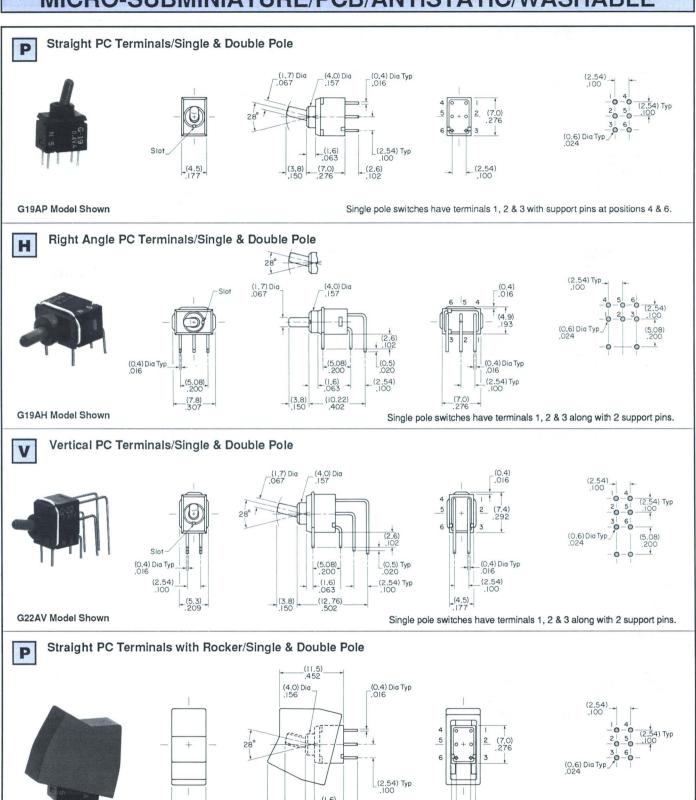


POLES AND CIRCUITS							
		ACTUATOR POSITION & TERMINAL NUMBER (Momentary)					
POLE & THROW	MODEL	Up	Center	Down			
SPDT	G12 G13 G15 G18 G19	ON NONE ON OFF ON NONE (ON) OFF ON OFF		ON ON (ON) (ON)			
CONNEC		2-3	OPEN	2-1			
SCHEM	ATIC		2 (COMM)				
G22 G23 DPDT G25 G28 G29		ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON)			
CONNEC		2-3 5-6	OPEN	2-1 5-4			
SCHEMATIC 2 (COMM) 59							
Terminal n	umbers are n	ot actually on the	switch.				



# **NKK** SERIES G TOGGLES & ROCKERS

#### MICRO-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

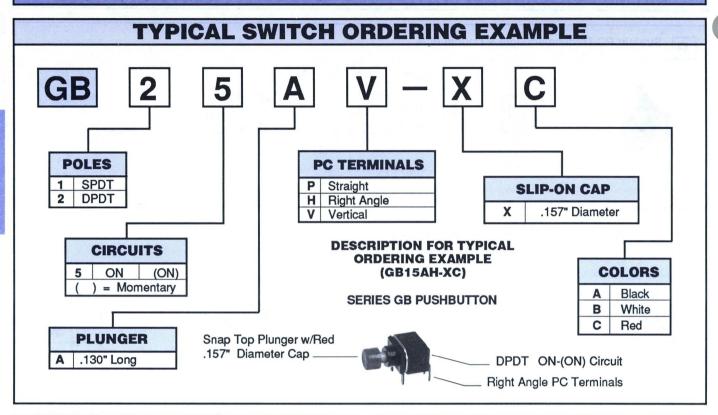


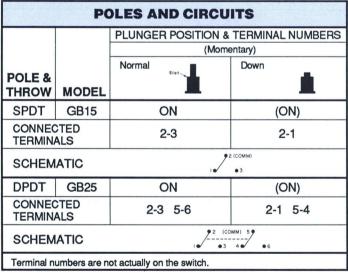
G23KP-YA Model Shown

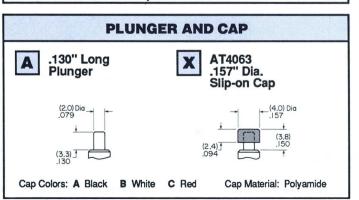
Single pole switches have terminals 1, 2 & 3 with support pins at positions 4 & 6.

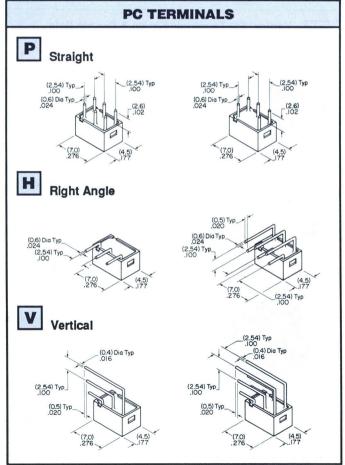
#### **NEW** SERIES GB PUSHBUTTON SWITCHES

#### MICRO-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE





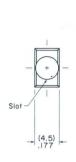


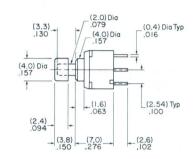


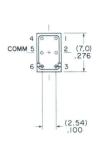
#### MICRO-SUBMINIATURE/PCB/ANTISTATIC/WASHABLE

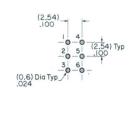












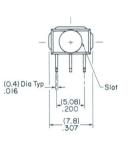
**GB25AP-XC Model Shown** 

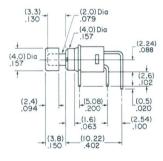
H

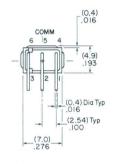
Single pole switches have terminals 1, 2 & 3 with support pins at positions 4 & 6.

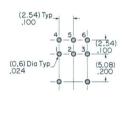
Right Angle PC Terminals/Single & Double Pole









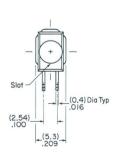


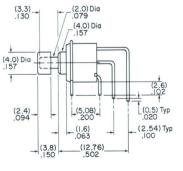
**GB25AH-XC Model Shown** 

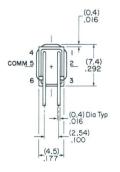
Single pole switches have terminals 1, 2 & 3 along with 2 support pins.

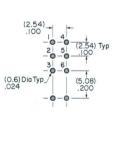
V Vertical PC Terminals/Single & Double Pole









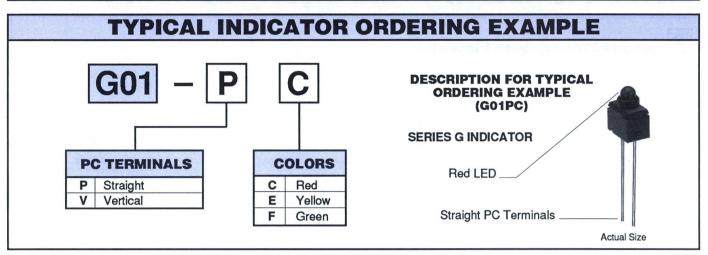


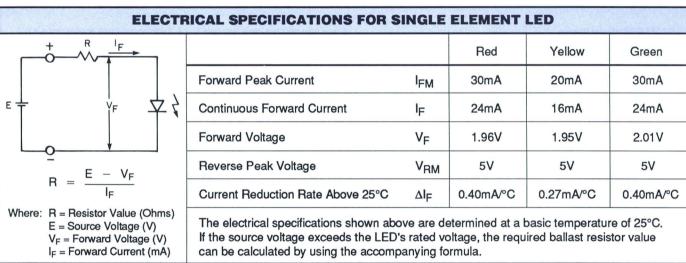
**GB25AV-XC Model Shown** 

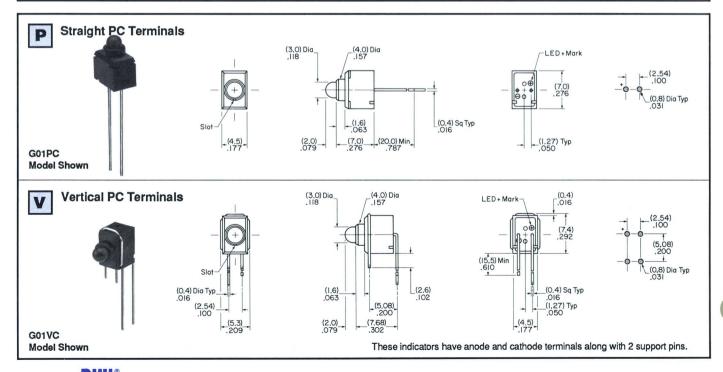
Single pole switches have terminals 1, 2 & 3 along with 2 support pins.

# **NKK®** SERIES G INDICATORS

#### MICRO-SUBMINIATURE/PCB







**Pushbuttons** 

# NKK® SERIES G3

#### MICRO-SUBMINIATURE/SURFACE MOUNT/WASHABLE

#### **DISTINCTIVE FEATURES**



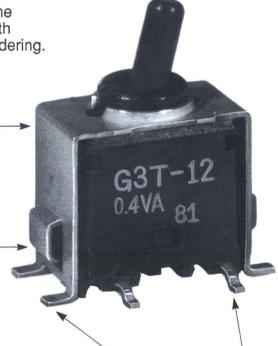
Micro-subminiature size (1/3 the volume of supersubminiatures) allows for high density mounting, and light weight of 0.65 grams makes these switches ideal for hand-held equipment.

Tape-reel and stick-tube packaging allow rapid automated placement of devices.

The use of heat resistant resin for the housing, base, and lever allows both vapor phase and infrared reflow soldering.

Totally sealed body prevents contact contamination and allows time- and money-saving automated soldering and washing.

Patented Sliding Twin Crossbar (STC) \_\_contact mechanism provides unequalled logic-level reliability and smoother actuation.





Designed with gull-wing terminals to satisfy the \_\_\_\_\_ need for mechanical stability during soldering and to provide simplified solder joint inspection.

Molded-in, epoxy sealed terminals lock out flux, solvents, and other contaminants.

#### **NKK** SERIES G3 TOGGLE SWITCHES

#### MICRO-SUBMINIATURE/SURFACE MOUNT/WASHABLE

#### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** (Resistive Load)

0.4VA maximum @ 28V AC/DC maximum (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

80 milliohms maximum

Insulation Resistance:

500 megohms minimum @ 500V DC

Dielectric Strength:

500V AC minimum

Mechanical Life:

50,000 operations minimum

**Electrical Life:** 

50,000 operations minimum

**Ambient Temp Range:** 

-25°C through +70°C (-13°F through +158°F)

Angle of Throw & Travel:

28° for toggle; 1.1mm (.043") total travel for pushbutton

**Nominal Operating Force:** 

Toggles: 95grams (momentary); 122grams (maintained)

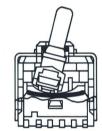
Pushbuttons: 183 grams

MATER	ALS & FINISHES
Actuator	Polyphenylene sulfide
Support Bracket	Phosphor bronze with tin-lead plating
Case	Polyphenylene sulfide (94-V0)
Sealing Rings	Nitrile butadiene rubber
Movable Contact	Phosphor bronze with gold plating over nickel
Stationary Contacts	Phosphor bronze with gold plating over nickel
Base	Polyphenylene sulfide (94-V0)
Terminals	Phosphor bronze with gold plating over nickel

#### WASHABILITY

The G3 Series switches are totally sealed, having a combination of design features which define their washability:

- 1) A rubber ring surrounds the actuator.
- 2) A rubber seal surrounds the base where it fits into the housing.
- 3) Epoxy is used at the joining of the case and base. 4) Terminals are molded into the base and epoxy sealed. These features allow timeand money-saving automated processing techniques used with today's surface mount technology. including flux cleaning procedures.



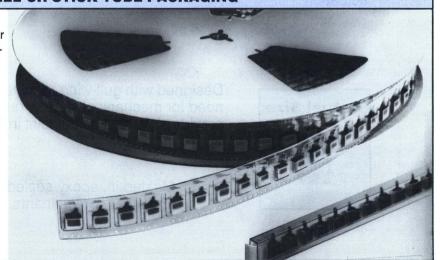
#### TAPE-REEL OR STICK-TUBE PACKAGING

G3 devices are packaged with 50 devices per stick-tube. The tube length for P type mounting models is 450mm and for B type mounting models is 525mm.

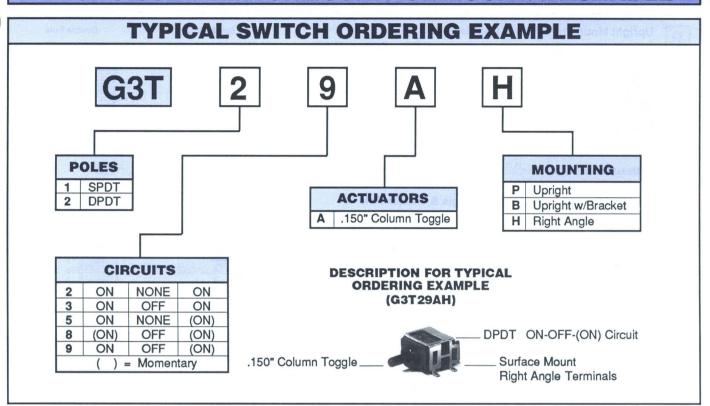
The right angle mounting devices are packaged only in a tape-reel 24mm wide with 500 devices per reel. The reel diameter is 330mm.

Both the tape-reel and stick-tube dimensions meet EIA standard 481A requirements.

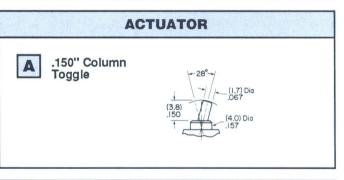
Antistatic packaging material is available upon request.



## **NKK** SERIES G3 TOGGLE SWITCHES



POLE & THROW MODEL  G3T12 G3T13 SPDT G3T15 G3T18 G3T19  CONNECTED TERMINALS		Center  NONE OFF	Down
POLE & MODEL  G3T12 G3T13 SPDT G3T15 G3T18 G3T19  CONNECTED	ON ON ON	NONE OFF	Down
POLE & MODEL  G3T12 G3T13 SPDT G3T15 G3T18 G3T19  CONNECTED	ON ON ON	NONE OFF	ON
THROW MODEL  G3T12 G3T13 SPDT G3T15 G3T18 G3T19  CONNECTED	ON ON ON	OFF	
G3T13 SPDT G3T15 G3T18 G3T19 CONNECTED	ON ON	OFF	
SPDT G3T15 G3T18 G3T19 CONNECTED	ON		011
G3T18 G3T19 CONNECTED		NICHIE	ON
G3T19 CONNECTED	(ON)	NONE	(ON)
CONNECTED		OFF	(ON)
	ON	OFF	(ON)
-	2-3	OPEN	2-1
		92 (COMM)	
SCHEMATIC		•3	
G3T22	ON	NONE	ON
G3T23	ON	OFF	ON
DPDT G3T25	ON	NONE	(ON)
G3T28	(ON)	OFF	(ON)
G3T29	ON	OFF	(ON)
CONNECTED 7	2-3 5-6 OPEN		2-1 5-4
SCHEMATIC	/	92 (COMM) 59 	
Terminal numbers are not a			



#### MOUNTING AND SOLDERING

Vapor Phase Reflow Soldering Time & Temperature Limits
60 seconds @ 150°C + 60 seconds @ 215°C (120 seconds total) Switches should be left in unheated state at least 10 minutes after soldering before they are washed.

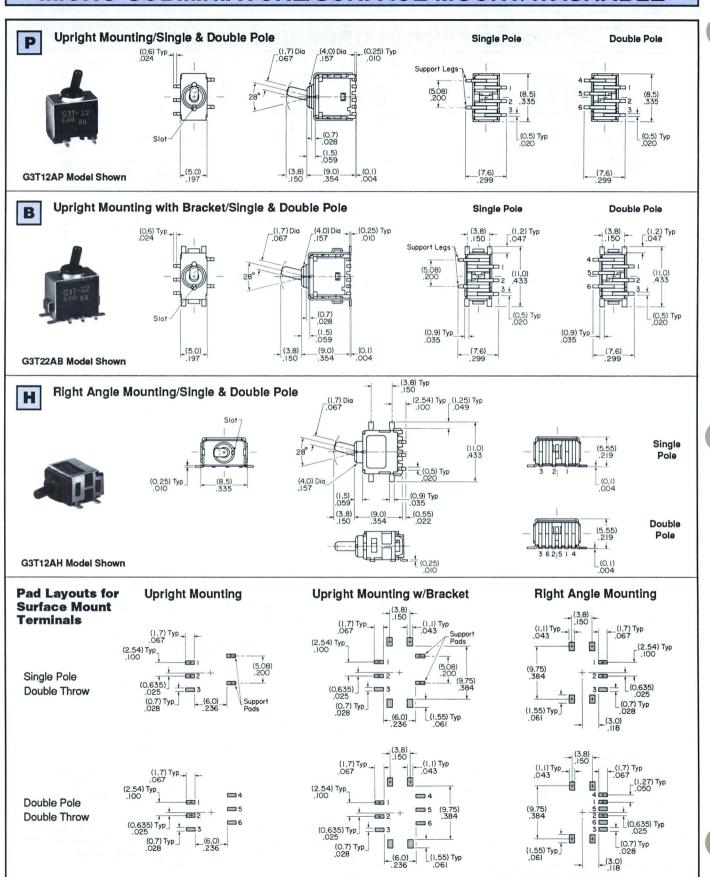
Infrared Reflow Soldering Time & Temp Limits
Preheat for 60 seconds @ 150°C (heat rise 1 - 5°C/second)
Soldering for 10 seconds @ 220°C

Manual Soldering Time & Temperature Limits 3 seconds @ 350°C or 10 seconds @ 260°C Eutectic solder is recommended.

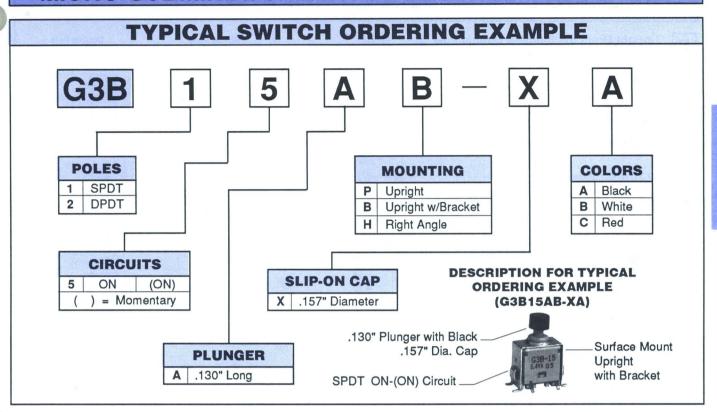
**Mounting Note** It is recommended that the body of models for upright mounting without bracket be fastened to a panel or similar support for protection of solder joints from mechanical stress.

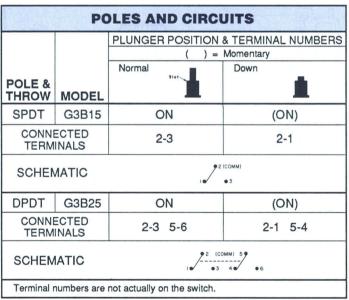
#### **NKK** SERIES G3 TOGGLE SWITCHES

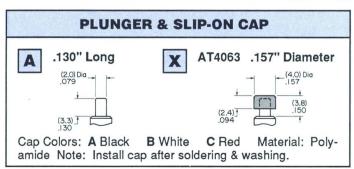
#### MICRO-SUBMINIATURE/SURFACE MOUNT/WASHABLE



#### MICRO-SUBMINIATURE/SURFACE MOUNT/WASHABLE

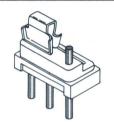






#### STC CONTACT MECHANISM

The design of NKK's patented. award-winning Sliding Twin Crossbar (STC) contact mechanism diminishes contact bounce to give unparalleled logic-level reliability.



#### MOUNTING AND SOLDERING

Vapor Phase Reflow Soldering **Time & Temperature Limits** 

60 seconds @ 150°C + 60 seconds @ 215°C (120 seconds total)

Switches should be left in unheated state at least 10 minutes after soldering before they are washed.

Infrared Reflow Soldering Time & Temp Limits
Preheat for 60 seconds @ 150°C (heat rise 1 - 5°C/second)
Soldering for 10 seconds @ 220°C

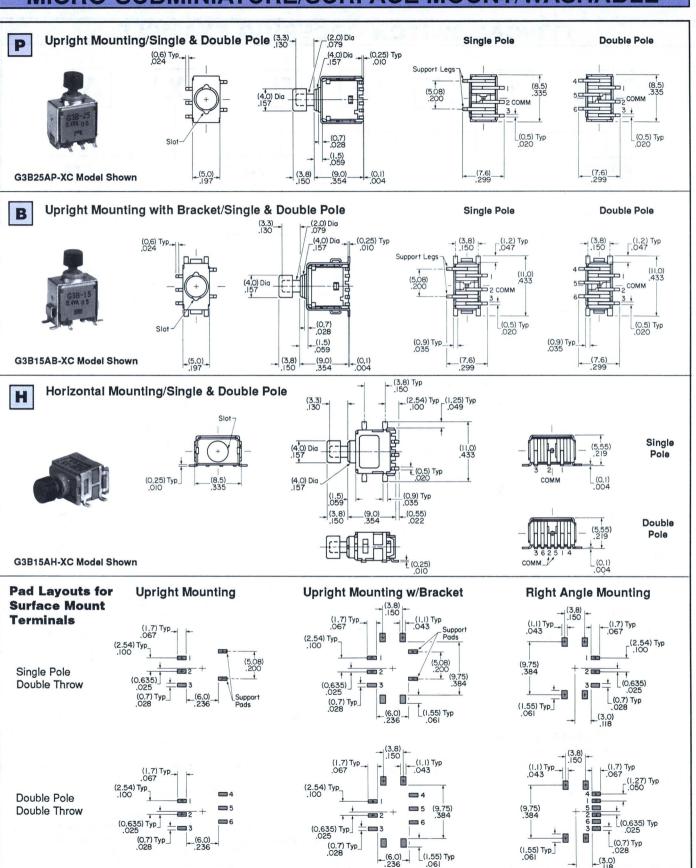
Manual Soldering Time & Temperature Limits 3 seconds @ 350°C or 10 seconds @ 260°C Eutectic solder is recommended.

**Mounting Note** 

It is recommended that the body of models for upright mounting without bracket be fastened to a panel or similar support for protection of solder joints from mechanical stress.

**WITCHES** • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

#### MICRO-SUBMINIATURE/SURFACE MOUNT/WASHABLE



# SERIES JB & JF LOW PROFILE WASHABLE KEYPAD SWITCHES



# NKK° SERIES JB

#### DOME CONTACT/LOW PROFILE/WASHABLE

#### **DISTINCTIVE FEATURES**

Low profile dimension from PCB to top of cap.

Bright, full surface illumination with red, green, or yellow LEDs.

270 gram operating force and short stroke of .300mm (.012") permit light touch operation.

Dome contact gives crisp tactile feedback to positively indicate circuit transfer and assures high reliability and long life of 1,000,000 operations.

Space saving body dimensions, 12.0mm (.472") square, provide for compact, side-by-side mounting on a standard grid.

Single-pole, single-throw contacts with strapped terminals allow X-Y coding on a single-sided PC board and simplify external circuit arrangement.





Terminal spacing conforms to standard .100" PCB grid.

Slanted terminals provide a spring \_\_\_\_\_\_ type action which ensures secure mounting and prevents dislodging during wave soldering.

## **NKK** SERIES JB KEYPAD SWITCHES

#### DOME CONTACT/LOW PROFILE/WASHABLE

#### **GENERAL SPECIFICATIONS**

#### **Short Actuator**

**Extended Actuator** 

Electrical Capacity: (Resistive Load)

50mA @ 24V DC maximum

125mA @ 24V DC maximum

Contact Resistance:

50 milliohms maximum

50 milliohms maximum

Insulation Resistance:

500 megohms minimum @ 250V DC

500 megohms minimum @ 250V DC

Dielectric Strength:

250V AC minimum

250V AC minimum

Mechanical Life:

5,000,000 operations minimum

1,000,000 operations minimum

Electrical Life: Total Travel: 5,000,000 operations minimum

1,000,000 operations minimum

Ambient Temp Range:

.254mm (.010")

.300mm (.012")

-25°C through +70°C (-13°F ~ +158°F)

-25°C through +70°C (-13°F ~ +158°F)

**Nominal Operating Force:** 

180 grams

270 grams

**Contact Bounce:** 

0.1 millisecond maximum

0.1 millisecond maximum

MATER	IALS & FINISHES
Plunger	Polyacetal
Case	Glass fiber reinforced polyamide
Seal	Nitrile butadiene rubber
Base	Glass fiber reinforced polybuty- lene terephthalate (UL 94V-0)
Movable Contact	Beryllium copper with silver plating
Stationary Contacts	Brass with silver plating
Terminals	Brass with silver plating

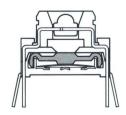
#### **APPLICATIONS**

These single pole single throw, momentary devices offer bright illumination with red, yellow or green LEDs.

Being single keys, these tact switches offer customers flexibility of key arrangement and pitch when placed in sets to meet specific panel design requirements. JB switches are ideal for numerous data input and control applications existing in today's products; such as, office automation equipment - copy machines, facsimiles and calculators, consumer electronics - VCRs, microwaves, televisions and remote controls; as well as, for cash registers and industrial equipment control panels.

#### **DOME CONTACT**

Spring action of the dome shaped movable contact gives the distinctive tactile feedback for which tact switches are known. This mechanical operation along with the use of copper alloy material assures a highly reliable device and provides long life, short stroke, plus light touch.



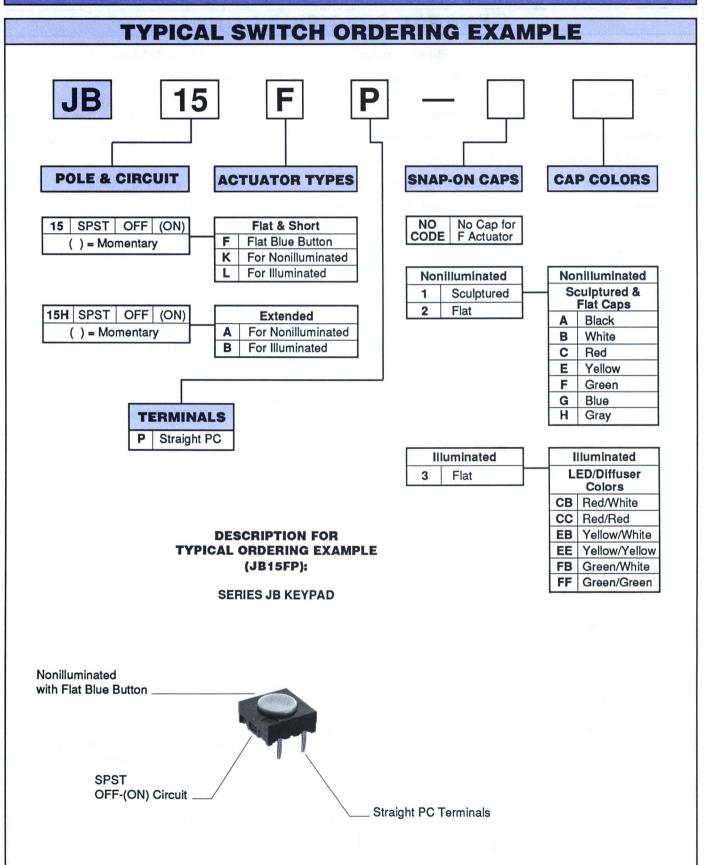
#### **LEGENDS**

Several methods of placing legends on the face of caps are available. The preferred method is pad printing due to its increased legend life. Hot stamping and engraving are also available. Details regarding these methods may be obtained from the factory.



## **NKK** SERIES JB KEYPAD SWITCHES

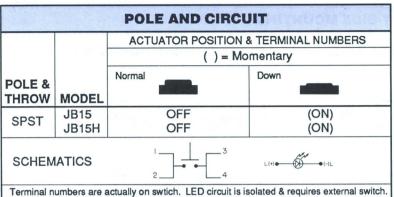
#### DOME CONTACT/LOW PROFILE/WASHABLE

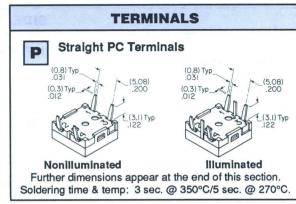


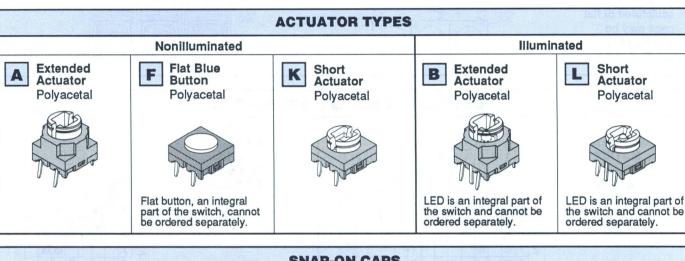
**UKK**®

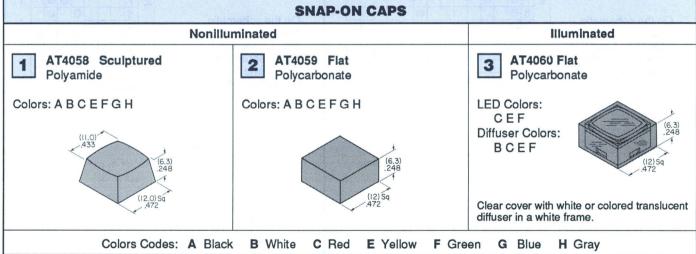
#### SERIES JB KEYPAD SWITCHES

#### DOME CONTACT/LOW PROFIL









LED :	SPECIFICATIONS			124	
LEDs are supplied as an integral part of illuminated			Red	Yellow	Green
devices and are not available separately.	Forward Peak Current	I <sub>FM</sub>	30mA	20mA	20mA
LED polarity markings are on the bottom of the switch. The electrical specifications shown are determined at a basic temperature of 25°C. If the	Continuous Forward Current	l <sub>e</sub>	20mA	15mA	15mA
source voltage exceeds the rated voltage, a	Forward Voltage	V <sub>F</sub>	2.0V	1.9V	1.95V
ballast resistor is required. The resistor value can	Reverse Peak Voltage	V <sub>RM</sub>	5V	5V	5V
be calculated by using the formula in the Supplement at the end of this catalog.	Current Reduction Rate Above 25°C	$\Delta l_{_{\rm F}}$	0.40mA/°C	0.27mA/°C	0.27mA/°C

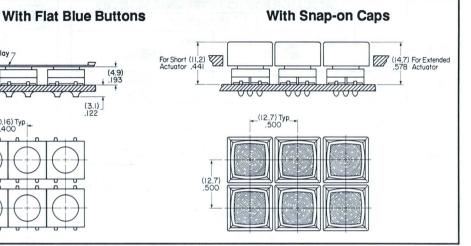
#### **NKK** SERIES JB KEYPAD SWITCHES

#### DOME CONTACT/LOW PROFILE/WASHABLE

#### SIDE-BY-SIDE MOUNTING

Customers may custom design a keyboard to meet their specific needs by using these single keypad switches. Flat blue button switches may be mounted beneath an overlay. Switches with sculptured or flat caps may be mounted in a panel cutout.

# (3.1) (10.16) Typ .400

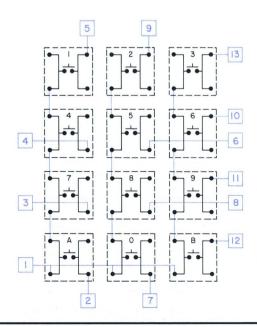


#### **DECODING SCHEMES & SCHEMATICS**

**COMMON BUS MATRIX** ON A SINGLE-SIDED PC BOARD

On the schematic, blue indicates PC board trace and black represents switch and its internal circuit.

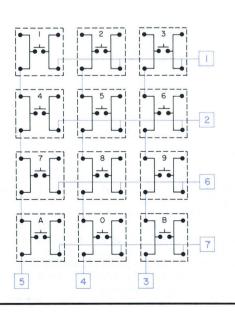
2 00				8						12	
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X-Y MATRIX ON A SINGLE-SIDED PC BOARD

On the schematic, blue indicates PC board trace and black represents switch and its internal circuit.

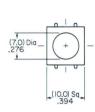
		1	2	3	4	5	6	7
	1	⊗				8		
	2	⊗			0			
	3	⊗		⊗				
	2 3 4					0		
	5		0		0			
Keys	6		⊗	₿				
	7					⊗	⊗	
	8				0		0	
	9			⊗			0	
	0				0			0
	Α					0		0
	В			0				0

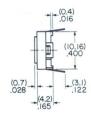


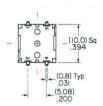
#### **NKK** SERIES JB KEYPAD SWITCHES

#### Nonilluminated/with Flat Blue Button









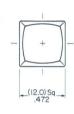


JB15FP Model Shown

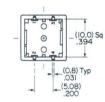
Spring action terminals conform to .100" PCB spacing.

#### Nonilluminated/with Sculptured Snap-on Cap









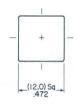


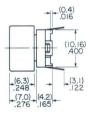
JB15KP-1C Model Shown

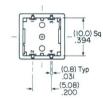
Spring action terminals conform to .100" PCB spacing.

#### Nonilluminated/with Flat Snap-on Cap











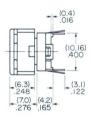
JB15KP-2C Model Shown

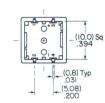
Spring action terminals conform to .100" PCB spacing.

#### Illuminated/with Flat Snap-on Cap









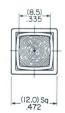


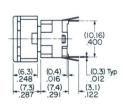
JB15LP-3CC Model Shown

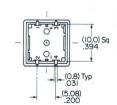
Spring action terminals conform to .100" PCB spacing.

#### Illuminated/with Flat Snap-on Cap











JB15HBP-3CC Model Shown

Spring action terminals conform to .100" PCB spacing.

Nonilluminated models do not have lamp terminals.

# " SERIES JF

#### DOME CONTACT/LOW PROFILE/WASHABLE

#### **DISTINCTIVE FEATURES**

Low profile dimensions from PCB to top of switch.

Wide choice of body shapes and colors.

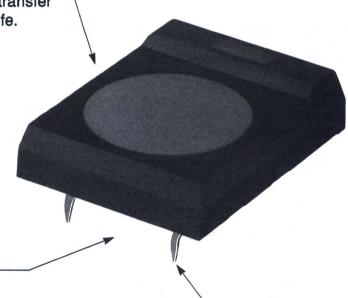
Minimal operating force and short stroke permit light touch operation.

Dome contact gives crisp tactile and audible. feedback to positively indicate circuit transfer and assures high reliability and long life.

Totally sealed contact mechanism permits wave soldering and washing.

Space saving body dimensions provide for compact, side-by-side mounting on a standard grid.

> Terminal spacing conforms to . standard .100" PCB grid.





Single-pole, single-throw contacts with strapped terminals allow X-Y coding on a single-sided PC board and simplify external circuit arrangement.

Crimped terminals provide a spring type action to ensure secure mounting and prevent dislodging during wave soldering.

## **NKK** SERIES JF KEYPAD SWITCHES

## DOME CONTACT/LOW PROFILE/WASHABLE

## **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

50mA @ 24V DC

Contact Resistance:

50 milliohms maximum

Insulation Resistance:

500 megohms minimum @ 250V DC

Dielectric Strength:

250V AC minimum

Mechanical Life:

500,000 operations minimum

**Electrical Life:** 

500,000 operations minimum

**Total Travel:** 

0.4mm (.016") for flush actuator & 0.8mm (.031") for sculptured actuator

**Ambient Temp Range:** 

-25°C through +70°C (-13°F through +158°F) for illuminated models -25°C through +85°C (-13°F through +185°F) for nonilluminated models

Nominal Operating Force:

200 grams with sculptured actuator; 350 grams with flush actuator

Contact Bounce:

0.1 millisecond maximum

MATERIALS & FINISHES				
Actuator	Polyamide			
Case	Glass fiber reinforced polyamide			
Seal	Nitrile butadiene rubber			
Base	Glass fiber reinforced polyester			
Movable Contact	Phosphor bronze with silver plating			
Stationary Contacts	Brass with silver plating			
Terminals	Brass with silver plating			

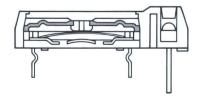
### **APPLICATIONS**

These tact switches are designed for compact mounting and offer flexibility in panel design. JF switches are ideal for use in today's wide array of miniaturized equipment: medical measuring instruments and devices for measuring thickness, water quality, etc.; communication equipment; automated office machines; consumer electronics; video switchers, AV special effects equipment, and monitoring camera system controllers.

These single pole single throw, momentary devices are available in both illuminated and nonilluminated versions. Inscriptions are available upon request to the factory. They are styled with a black housing in contrast to the colored, round or square actuators. Spot illuminated models are offered with red, yellow, or green LEDs and with isolated lamp circuits. Actuators are available in a choice of five colors.

## **PROCESS SEALED & SPLASHPROOF**

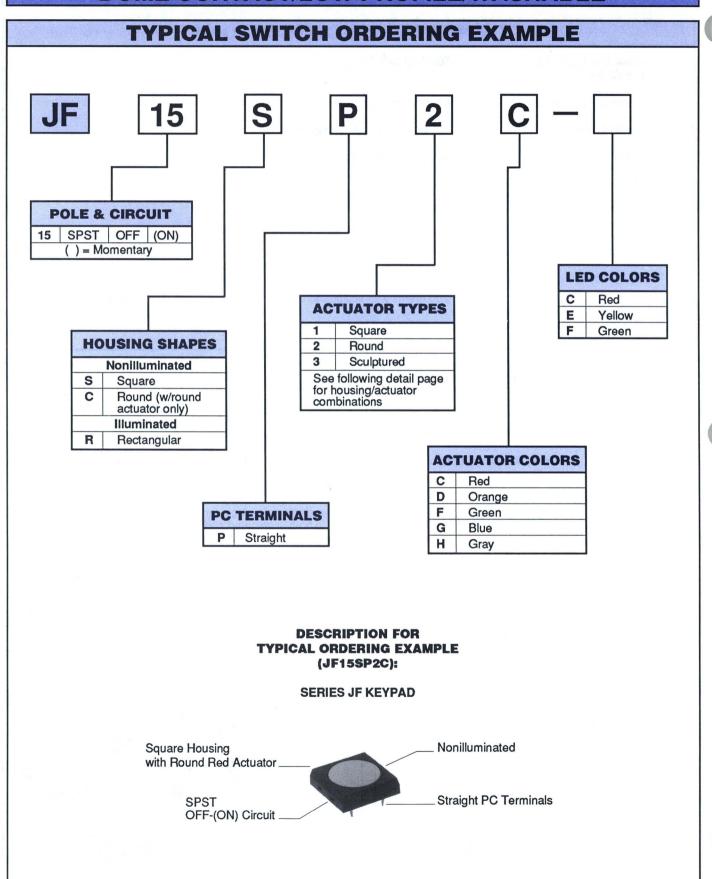
The contact mechanism is surrounded by a rubber seal which permits the switches to be subjected to time-and money-saving automated soldering methods. They can also be safely cleaned of flux using alcohol based clean-ing solvents. (Other solvents are not recommended.) Switches should not be operated or have any pressure on the actuators during washing.



# MODEL VARIATIONS Illuminated Nonilluminated

## **NEW SERIES JF KEYPAD SWITCHES**

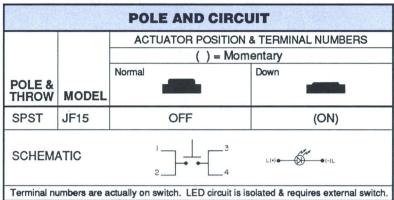
## DOME CONTACT/LOW PROFILE/WASHABLE

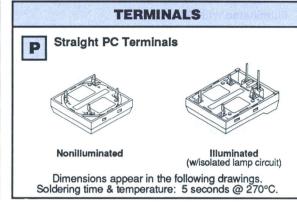


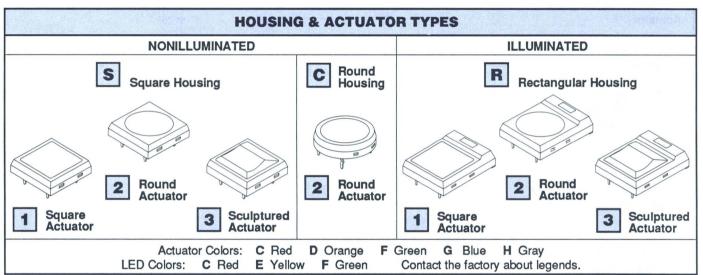
## **UKK**®

## SERIES JF KEYPAD SWITCHES

## DOME CONTACT/LOW PROFILE/WASHABLE





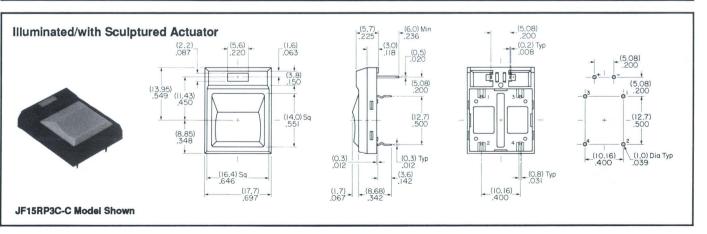


LEDs are supplied as an integral part of illuminated devices and are not available separately. LED polarity markings are on the bottom of the switch, The electrical specifications shown are determined at a basic temperature of 25°C. If the source voltage exceeds the rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula at the end of this catalog.

LED SPECIFICATIONS

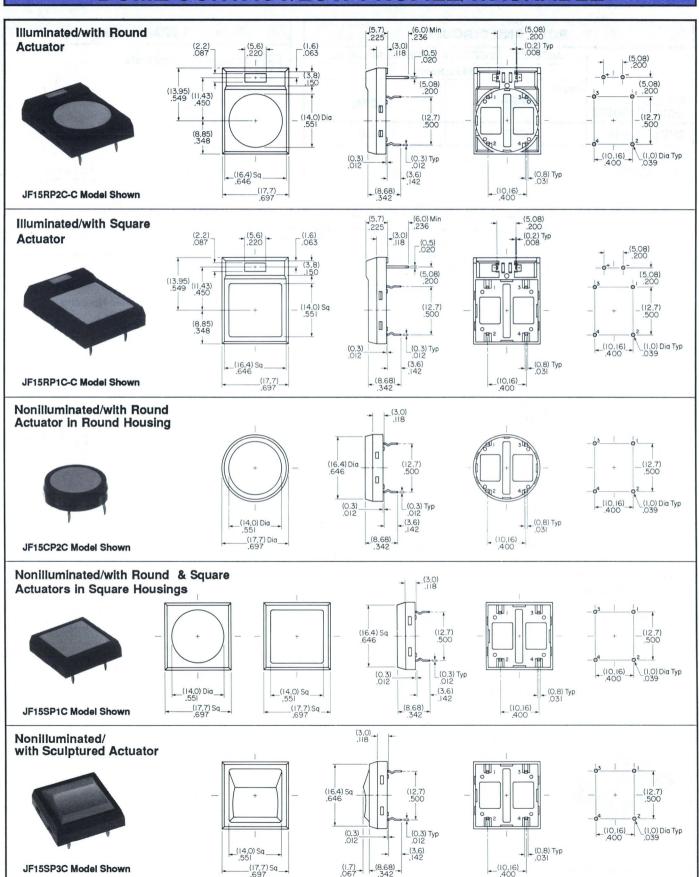
Forward Peak Current
Continuous Forward
Current
Forward Voltage
Reverse Peak Voltage
Current Reduction
Rate Above 25°C

		Red	Yellow	Green
Forward Peak Current	$I_{FM}$	40mA	40mA	40mA
Continuous Forward Current	IF	30mA	30mA	30mA
Forward Voltage	V <sub>F</sub>	1.7V	2.2V	2.2V
Reverse Peak Voltage	V <sub>RM</sub>	4V	4V	4V
Current Reduction Rate Above 25°C	$\Delta I_{F}$	0.67mA/°C	0.67mA/°C	0.67mA/°C

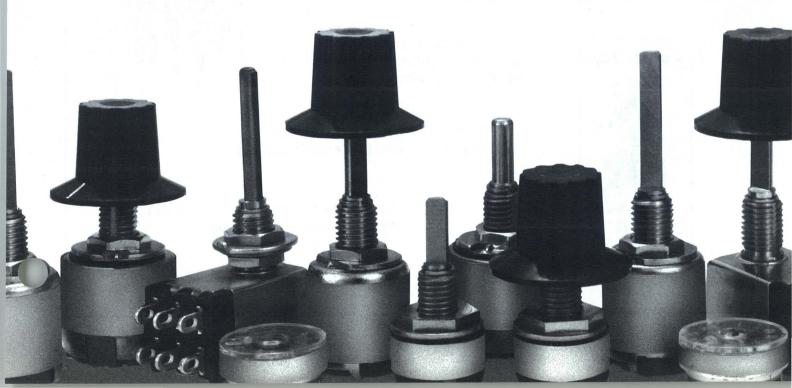


## **NKK** SERIES JF KEYPAD SWITCHES

## DOME CONTACT/LOW PROFILE/WASHABI



# SERIES MIR MINIATURE ROTARY SWITCHES



## NKK SERIES MR

## **MINIATURE ROTARY SWITCHES**

## **DISTINCTIVE FEATURES**

Low profile bodies accommodate the space limitations required for PCB mounting. Behind panel body depths ranging from .323" for MRF models to .681" for MRX models.

Flatted and slotted shafts with black polyacetal knob supplied as \_ standard component.

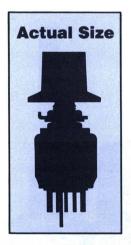
Positive detent mechanism for distinct feel and audible feedback.

Metal bushing and housing \_\_\_\_\_ construction increases durability.

Adjustable stopper plate allows multiple \_ settings: 2 - 12 positions and continuous rotation.

High contact reliability achieved by the self-cleaning contact mechanism.

Contact mechanism on all models is break before make (nonshorting).



Sealed construction of MRA, \_\_ MRF, and MRK models allows washing after wave soldering.

Terminals molded in to prevent — entry of flux and other contaminants.

Models for the MR Series are provided with turret, solder lug, and PC terminals.



K2

## NKK SERIES MR

## **MINIATURE ROTARY SWITCHES**

## **APPLICATIONS**



NKK offers a wide variety of miniature, half-inch diameter rotaries in its MR Series. Shaft and screwdriver actuation; single, double, and four poles; fixed and adjustable stop settings, as well as continuous rotation; PC board and panel mounting capabilities--all are available for customer selection. Contact ratings range from 0.4VA maximum @ 28V maximum in the MRF and MRK devices to 10A @ 125V AC in the MRT22 device. Switches in the MR Series are designed with 30° indexing for the MRA, MRF, and MRK models, 45° for MRX, 60° for MRY and MRT23, and 120° for the MRT22 models.

All MR switches have molded-in terminals. The MRA, MRF, and MRK models have an interior housing seal for washability, and the MRF and MRK models have the added protection of a shaft rubber o-ring. The MRA and MRK devices also have an exterior rubber washer and double flatted bushing for splashproof applications. The polyamide cover of the MRF model provides exterior protection.

These half-inch diameter rotaries are suited to many applications, including communication equipment, test instruments, computers, computer peripherals, and medical apparatus.



MATERIALS & FINISHES					
Shaft	Brass with nickel plating				
Stopper Plate	Steel with zinc plating for MRA, MRK, MRX, and MRY Polyamide cover with stopper for MRF				
Bushing/Housing	Zinc alloy with zinc plating for MRA, MRF, and MRK Brass with nickel plating for MRX, MRY, and MRT				
Movable Contacts	Copper with silver plating for MRA Phosphor bronze with gold plating for MRF and MRK Silver alloy for MRX and MRT Copper with silver plating for MRY				
End Contacts & Terminals	Brass with silver plating for MRA Phosphor bronze with gold plating for MRF and MRK Copper with silver plating for MRX and MRT Silver alloy plus brass with silver plating for MRY				
Common Contacts & Terminals	Brass with silver plating for MRA Phosphor bronze with gold plating for MRF and MRK Copper with silver plating for MRX, MRY, and MRT22 Brass with silver plating for MRT23				
Base	Diallylphthalate for MRA Fiberglass reinforced polyamide for MRF and MRK Phenolic resin for MRX, MRY, and MRT				

## **CONTACT MECHANISM**

All models are break before make (nonshorting).

MRA Self-cleaning, sliding contact

MRF Self-cleaning,

rotary contactor disk

MRK Self-cleaning,

rotary contactor disk

MRX Self-cleaning, sliding contact

MRY Rotary contactor dish

MRT Butt contacts

## **UL RECOGNITION**

These MRT models are recognized by Underwriters Laboratories Inc. at the following ratings:
MRT22 10A@125V AC
MRT23 5A@125V AC
UL File Number E44145

## **NKK** SERIES MR ROTARY SWITCHES

## HALF-INCH DIA./WASHABLE/ENCLOSED/SINGLE DECK

## **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

250mA @ 125V AC or 48V DC for MRA

(Resistive Load)

0.4VA maximum @ 28V maximumAC/DC for MRF & MRK

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

10 milliohms maximum for MRA

50 milliohms maximum for MRF & MRK

Insulation Resistance:

100 megohms minimum @ 500V DC

Dielectric Strength:

1.000V AC minimum for MRA

500V AC minimum for MRF & MRK

**Mechanical Life:** 

30,000 operations minimum

**Electrical Life:** 

10,000 operations minimum

**Ambient Temp Range:** 

-10°C through +70°C (+14°F through 158°F)

Indexing:

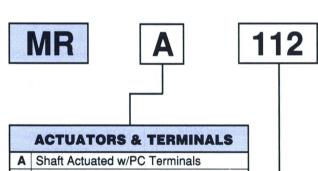
30°

Range of Operating Torque:

250 ~ 750 grams-cm for MRA

50 ~ 250 grams-cm for MRF & MRK

## TYPICAL SWITCH ORDERING EXAMPLE



**DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (MRA112):** 

**SERIES MR ROTARY** 

- Low Profile Screwdriver Actuated w/PC Terminals
- Low Profile Shaft Actuated w/PC **Terminals**

SP with 2-12 Adjustable Positions

## **Shaft Actuated** PC Terminals

**POLES & CIRCUITS** 

112 SP with 2-12 positions 206 DP with 2-6 positions

4P with 2-3 positions

403

Note: One knob is supplied with each switch.

## **NKK** SERIES MR ROTARY SWITCHES

## HALF-INCH DIA./WASHABLE/ENCLOSED/SINGLE DECK

ACTUATOR	S & TERM	INALS			
	Shaft Actuated w/PC Terminals				
(3.15) Dia (10) .394	(6) .236 .031	000 = MR-A1			
Low Profile Screwdriver w/PC Termir					
(3.15) Dia (1) .124 (1) .039	(3.5) 1.138 (0.5) (0.5) Thk = (0.25) (0.0)				
Low Profile Shaft Actuat w/PC Termir	ed				
(3.15) Dia .124 (10) .394	(3.5) .138 .(0.5) .020 Thk = (0.25)	(0) (7) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1			

the free and through them is a facility of card and are religious, and when the								
POLES & CIRCUITS								
POLE	MODEL	NUMBER OF POSITIONS	STOPPER SETTINGS	NUMBER OF TERMINALS				
SP	MRA112 MRF112 MRK112	2-12 2-12 2-12	2, 3, 4, 12 2, 3, 4, 12 2, 3, 4, 12	1 COMM, 12 LOAD 1 COMM, 12 LOAD 1 COMM, 12 LOAD				
SCHE	SCHEMATIC 1 2 3 4 5 6 7 8 9 10 11 12							
DP	MRA206 MRF206 MRK206	2-6 2-6 2-6	2, 3, 4, 5, 6 2, 3, 4, 5, 6 2, 3, 4, 5, 6	2 COMM, 12 LOAD 2 COMM, 12 LOAD 2 COMM, 12 LOAD				
SCHEMATIC 2 3 4 5 6 1 2 3 4 5 6								
4P	MRA403 MRF403 MRK403	2-3 2-3 2-3	2, 3 2, 3 2, 3	4 COMM, 12 LOAD 4 COMM, 12 LOAD 4 COMM, 12 LOAD				
SCHEMATIC 2-0 2,0 4 00 mm, 12 20 ND								

## **POSITION SETTING**

Each switch is supplied with the stopper set for the maximum number of positions allowed for that model. Prior to installation, the desired position setting should be made.

### MRF Models:

Remove the protective cover from the switch body.

Turn the shaft counterclockwise to the extreme left by using a screwdriver.

Inside the cover is a magnifying lens which should be positioned over the number which is to be the maximum position used; when the cover is then snapped onto the switch, the projection beside the lens fits into the correct hole for setting the stop.





### MRA and MRK Models:

- Using the actuator knob, turn the shaft counterclockwise to the extreme left. If the shaft is not turned counterclockwise to the extreme left, proper setting cannot be achieved. At this extreme position, the white line on the knob points to the number 1 position shown on the side of the switch.
- 2. Remove the knob from the shaft and loosen the nut far enough to allow raising the stopper plate for resetting to the desired position.
- Note the position numbers on the side of the switch; these correspond
  to the terminal numbers and stopper holes. Insert the stopper in the
  hole numbered for the maximum desired number of stop settings.
  Satisfactory switch funtioning cannot be assured if the stopper plate
  is not properly positioned.
- 4. Tighten the nut (beveled side up) firmly against the stopper plate.



## **NKK® SERIES MR ROTARY SWITCHES**

## HALF-INCH DIA./WASHABLE/ENCLOSED/SINGLE DECK



### AT513M Hexagon Nut Brass, nickel plated



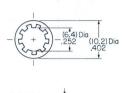
(9.0) (1.5) .354

2 for MRA; 1 for MRK

AT507M Locking Ring Steel, chromate

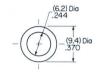


AT509 Lockwasher Steel, chromate over zinc plating



1 for MRA

AT535 Rubber Ring Nitrile butadiene rubber

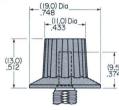


1 for MRK

## KNOBS

### AT433 Plain Black

Polyacetal Black only (supplied)



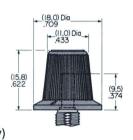
## AT4103 Short Color Tipped

Polyester with polyamide tip Black Base Tip Colors: A, B, C, E, F, G, H (order separately)



## AT4104 Long Color Tipped

Polyester with polyamide tip Black Base Tip Colors: A, B, C, E, F, G, H (order separately)



### **PANEL CUTOUTS**

## Nonsealed Panel

Without Keyway





## Sealed Panel



## **MAXIMUM EFFECTIVE PANEL THICKNESS**

With Standard Hardware on Nonsealed Panel: MRA 1.7mm (.067") MRK 2.2mm (.087")

Without Locking Ring on Nonsealed Panel: MRA 2.5mm (.098") MRK 3.0mm (.118")

With Standard Hardware on Sealed Panel: MRK 2.7mm (.106")

### **INSTALLATION & SOLDERING**

The MRK devices are designed to be panel mounted. Installation without panel mounting will affect reliability.

Soldering Limits:

3 seconds @ 350°C or 5 seconds @ 270°C

### HARDWARE ASSEMBLY

Standard Mounting Hardware Packaged Loose with Each Switch:







Lockwasher







Factory Assembled:

Hex Nut

Stopper Plate

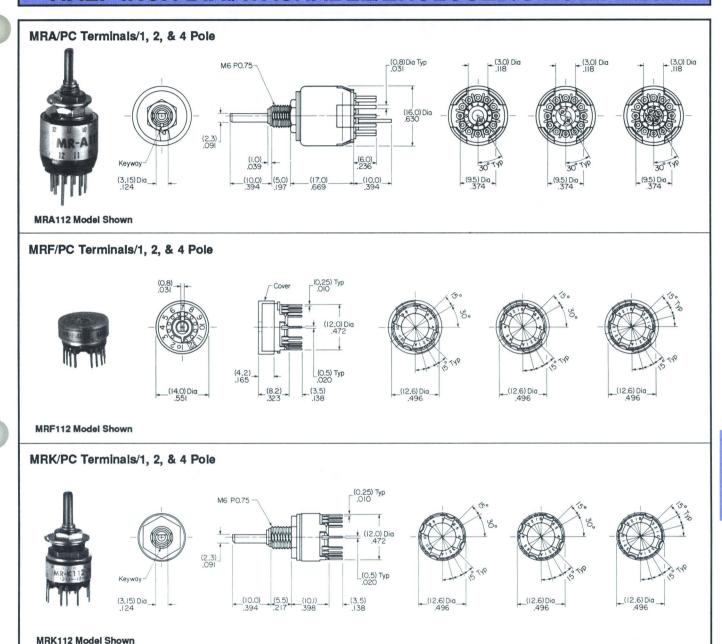
Metal Washer

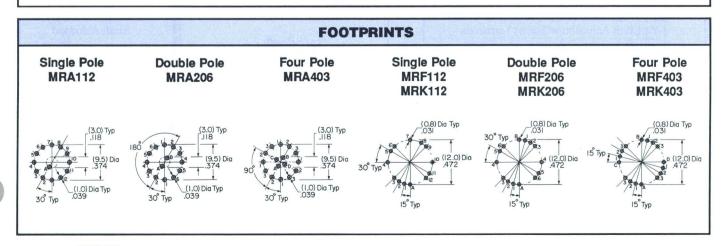
Rubber Washer (MRA)



## **NKK** SERIES MR ROTARY SWITCHES

## HALF-INCH DIA./WASHABLE/ENCLOSED/SINGLE DECK





## **NKK** SERIES MR ROTARY SWITCHES

## HALF-INCH DIA./ENCLOSED/SINGLE DECK

## **GENERAL SPECIFICATIONS**

Electrical Capacity: 2A @ 125V AC or 1A @ 30V DC for MRX (Resistive Load) 3A @ 125V AC or 2A @ 30V DC for MRY

10A @ 125V AC or 4A @ 30V DC for MRT22 5A @ 125V AC or 3A @ 30V DC for MRT23

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 100 megohms minimum @ 500V DC for MRX & MRY

200 megohms minimum @ 500 V DC for MRT

**Dielectric Strength:** 1,000V AC minimum

Mechanical Life: 15,000 operations minimum

Electrical Life: 7,500 operations minimum

Ambient Temp Range: -10°C through +70°C (+14°F through 158°F)

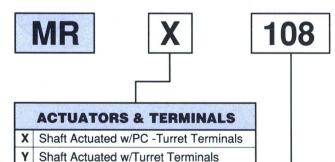
Indexing: 45° for MRX 60° for MRY

120° for MRT22 60° for MRT23

Range of Operating Torque: 500 ~ 1500 grams-cm for MRX

500 ~ 1000 grams-cm for MRY 200 ~ 500 grams-cm for MRT

## **TYPICAL SWITCH ORDERING EXAMPLE**



Shaft Actuated w/Solder Lug Terminals

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (MRX108):

**SERIES MR ROTARY** 

SP with 2-8 Adjustable Positions

2-8 \_\_\_\_\_ Shaft Actuated

PC-Turret Terminals

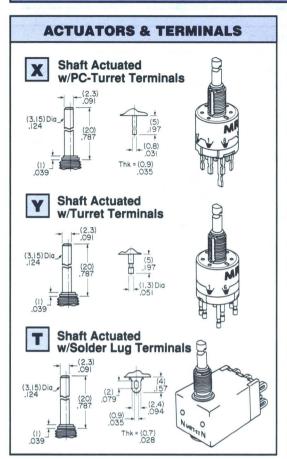
Note: One knob is supplied with each switch.

IMPORTANT: MRT switches are supplied without UL marking unless specified. See Supplement for instructions.

MRX108 SP with 2-8 positions
MRY106 SP with 2-6 positions
MRX204 DP with 2-4 positions
MRX402 4P with 2 positions
MRT22 DPDT ON-NONE-ON
MRT23 DPDT ON-OFF-ON

## **NEW SERIES MR ROTARY SWITCHES**

## F-INCH DIA./ENCLOSED/SINGLE DECK



POLES & CIRCUITS							
POLE	MODEL	NUMBER OF POSITIONS	STOPPER SETTINGS	NUMBER OF TERMINALS			
SP	MRX108	2-8 2-6	2, 3, 4, 8	1 COMM, 8 LOAD			
SCHEMATIC 2-6 2, 3, 4, 6 1 COMM, 6 LOAD							
DP	MRX204	2-4	2, 3, 4	2 COMM, 8 LOAD			
SCHE	MATIC		A B 1 2 3 4 1 2 3 4	7.8			
DPDT	MRT22 MRT23	2	ON-NONE-ON ON-OFF-ON	2-3 2-1 5-6 5-4 2-3 open 2-1 5-6 open 5-4			
SCHEMATIC 2 (COMM) 5							
4P	MRX402	2	1 & 2	4 COMM, 8 LOAD			
SCHEMATIC A B C D							

### **POSITION SETTING**

Each switch is supplied with the stopper set for the maximum number of positions allowed for that model. Prior to installation, the desired position setting should be made.

### MRX and MRY Models:

- 1. Using the actuator knob, turn the shaft counterclockwise to the extreme left. If the shaft is not turned counterclockwise to the extreme left, proper setting cannot be achieved. At this extreme position, the white line on the knob points to the number 1 position shown on the side of the switch.
- 2. Remove the knob from the shaft and loosen the nut far enough to allow raising the stopper plate for resetting to the desired position.
- 3. Note the position numbers on the side of the switch; these correspond to the terminal numbers and stopper holes. Insert the stopper in the hole numbered for the maximum desired number of stop settings. Satisfactory switch funtioning cannot be assured if the stopper plate is not properly positioned.
- 4. Tighten the nut (beveled side up) firmly against the stopper plate.



**AT433** Plain Black

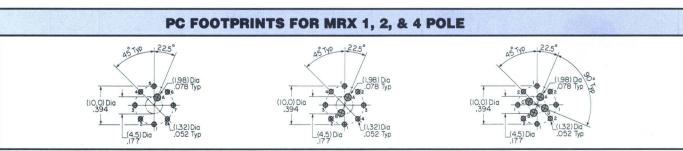
(supplied with switch)

AT4103 **Short Color Tipped** (must be ordered separately)

AT4104 Long Color Tipped (must be ordered separately)

Cap details are on page K6 where materials, colors, and dimensions are shown.

Stopper Plate



## **NKK** SERIES MR ROTARY SWITCHES

## HALF-INCH DIA./ENCLOSED/SINGLE DECK

### **MOUNTING & SOLDERING**

The standard mounting hardware supplied with each switch is hex nut AT513M (2 for MRT), locking ring AT507M, and lockwasher AT509. Dimension drawings of this hardware, panel cutouts, and knob AT433 are shown in the previous section.

### **Maximum Effective Panel Thickness**

With Standard Hardware: MRX & MRY 2.4mm (.095") MRT 2.7mm (.106")

Without Locking Ring: MRX & MRY 3.2mm (.126") MRY 3.5mm (.138")



Standard Hardware Packaged Loose

Factory assembled:

Hex Nut

Stopper Plate

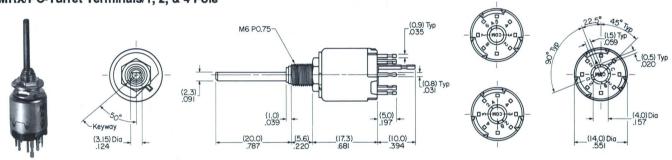


## Soldering Limits:

3 seconds @ 350°C

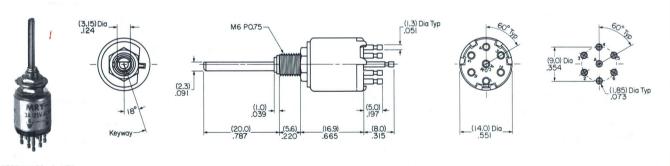
5 seconds @ 270°C



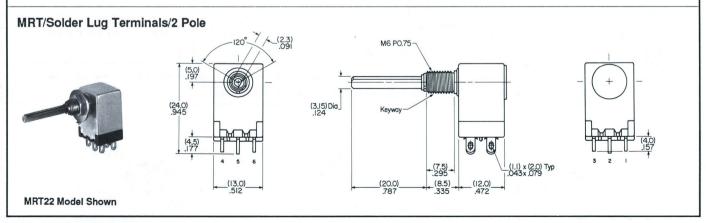


MRX108 Model Shown

## MRY/Turret Terminals/1 Pole



MRY106 Model Shown



## SERIES SK

COMPACT KEYLOCK SWITCHES



## NKK® SERIES SK

## COMPACT/BUSHING OR PCB MOUNTABLE

## **DISTINCTIVE FEATURES**

## **Bushing Mount**

12mm diameter bushing for easy panel \_\_\_\_\_ cutout preparation & high density mounting.

Rated 3 amp resistive load.

Epoxy sealed terminals prevent entry of flux & other contaminants.

UL recognized & CSA certified for 3A @ 125V AC & 1A @ 250V AC.

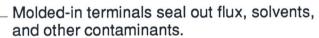
Short behind panel dimension - only 27.0mm (1.063").

High dielectric strength of 1,500 volts between contacts & case.



Actual Size

## PCB Mount



Small body size for high density mounting.

Sealed switch body allows automated soldering.

Actual Size

Disposable boot for safe washing process.

## **Bushing & PCB Mount**

Detent mechanism gives crisp, positive action for accurate switch setting.

Self-wiping contacts assure contact reliability and continuity.

Dust resistant interior construction protects contacts.

## **COMPACT/3 AMP/BUSHING MOUNTABLE**

## **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

3A @ 125V AC

(Resistive Load)

1A @ 250V AC

Contact Resistance:

10 milliohms maximum

Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1.000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life:

30,000 cycles minimum

Electrical Life:

10,000 cycles minimum

**Operating Torque:** 

270 grams-cm (3.74 ounce-in) average

**Ambient Temp Range:** 

-10°C through +70°C (+14°F through +158°F)

### **LOCK MECHANISM**

Bushing mount SK switches have a 3-tumbler locking mechanism.

Two keys are supplied with each switch (no master key available). Key AT4081 is used for 2-position models SK12A and SK12B and is marked "1201". Key AT4082 is used with 3-position models SK13D and SK13E and is marked "1301". Key dimensions and materials are shown in the Accessories section.

Bushing mount models are recognized by Underwriters Laboratories Inc. under file number E44145 and certified by Canadian Standards Association under file numbers LR23535 and LR56017.

## **CONTAMINANT RESISTANCE**

Due to the indirect path created by the design of the interior actuator mechanism, these switches resist the intrusion of dust and other contaminants.

Further protection to the contacts is provided by epoxy sealing the terminals to lock out flux and other contaminants.

MATERIALS & FINISHES				
Key	Die cast zinc alloy with chrome plating			
Cover (Housing Top)	Die cast zinc alloy with chrome plating			
Housing/Bushing	Die cast zinc alloy with matte finish chrome plating			
Base	Phenolic resin (thermoset)			
Movable Contactor	Silver alloy			
Stationary Contacts	Silver capped copper with silver plating			
Terminals	Copper or brass with silver plating			

## **MOUNTING CONSIDERATIONS**

### Standard Hardware

AT527M Hex Mounting Nut AT508 Internal Tooth Lockwasher

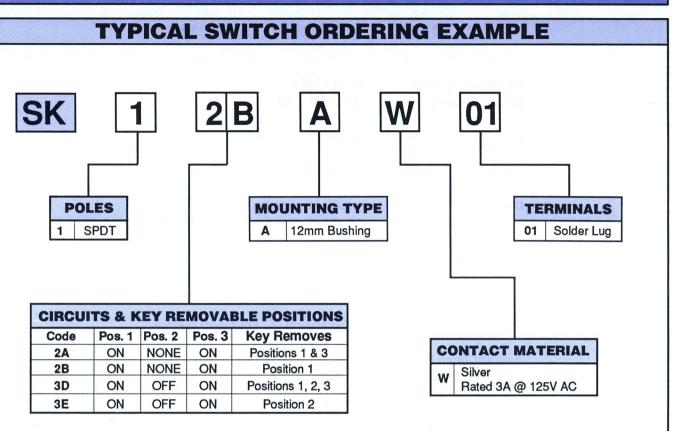
### Soldering Time & Temperature Limits

3 seconds @ 350°C 5 seconds @ 270°C

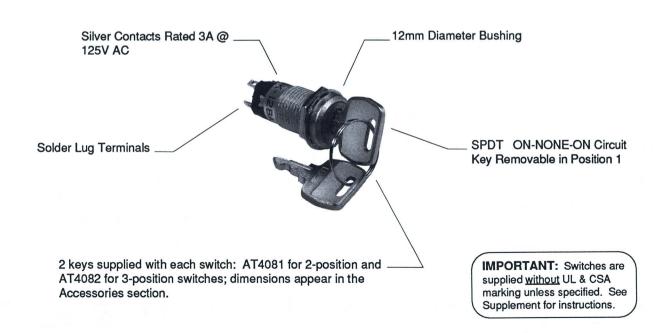
## Wiring Specs

Solder lug terminals have a .043" X .079" oval hole which accommodates 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

## **COMPACT/3 AMP/BUSHING MOUNTABLE**



## **DESCRIPTION FOR TYPICAL KEYLOCK ORDERING EXAMPLE: (SK12BAW01)**

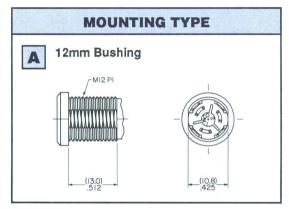


## COMPACT/3 AMP/BUSHING MOUNTABLE

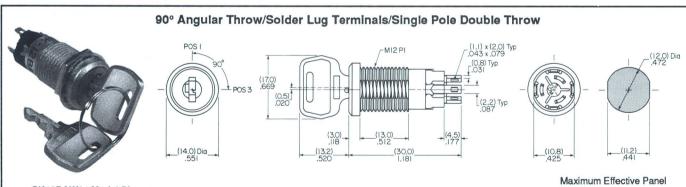
POLES, CIRCUITS, & KEY-REMOVABLE POSITIONS								
POLE & THROW	MODEL NUMBER	CIRCUIT POSITIONS	CONNE POS 1	CTED TER POS 2	RMINALS POS 3	KEY REMOVABLE	ANGULAR THROW	LOCK POSITION
SPDT	SK12A	ON-NONE-ON	COM-1		COM-2	Position 1 & 3	90°	POS I
SPDT	SK12B	ON-NONE-ON	COM-1		COM-2	Position 1	90°	POS I
SPDT	SK13D	ON-OFF-ON	COM-1	OPEN	COM-2	Positions 1, 2, 3	45°	POS 1 @ 3
SPDT	SK13E	ON-OFF-ON	COM-1	OPEN	COM-2	Position 2	45°	POSI © 3
Terminal nu	mbers are on the	switch.				ey Removable		Key-end View

## **KEY REMOVABLE**

- Positions 1 & 3 (90° angular throw)
- Position 1 B (90° angular throw)
- Positions 1, 2, & 3 (45° angular throw)
- Position 2 (45° angular throw)



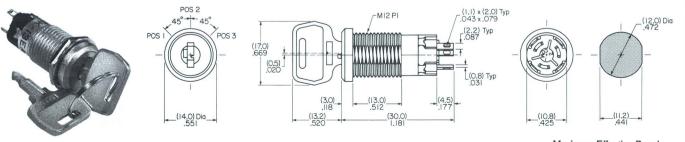




SK12BAW01 Model Shown

## Thickness: 8.0mm (.315")

## 45° Angular Throw/Solder Lug Terminals/Single Pole Double Throw



SK13EAW01 Model Shown

Maximum Effective Panel Thickness: 8.0mm (.315")

## COMPACT/WASHABLE/PCB MOUNTABLE

## **GENERAL SPECIFICATIONS**

Electrical Capacity: 0.4VA maximum @ 28V AC/DC maxaimum

(Resistive Load) (Applicable Range: 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance: 80 milliohms maximum

Insulation Resistance: 100 megohms minimum @ 500V DC

Dielectric Strength: 500V AC minimum

Mechanical Life: 30,000 cycles minimum

Electrical Life: 10,000 cycles minimum

Operating Torque: 270 grams-cm (3.74 ounce-in) average for momentary action models

210 grams-cm (2.91 ounce-in) average for maintained action models

Ambient Temp Range: -25°C through +70°C (-13°F through +158°F)

### **APPLICATIONS**

SK Series answers the need for highly reliable, space efficient keylock devices. These switches are used in lower security applications such as modems, test equipment, controllers, and other compact devices.

These keylocks are offered with either 2 positions (90° step) or 3 positions (45° step) and have a variety of key removable positions. A single tumbler plate is used in the PCB mounting models.

### **SEALED CONSTRUCTION**

PCB mountable SK keylock switches are designed with three features which seal out contaminants. A gasket is placed between the base and the housing, terminals are insert molded, and a dip cap is provided so these PCB mounting devices can undergo wave soldering and automated washing conditions with complete safety to the switch mechanism.

MATERIALS & FINISHES				
Key	Brass with ABS resin			
Tumbler Barrel	Polyacetal			
Bushing	Die cast zinc alloy with nickel plating			
Bracket	Steel with chromate over zinc plating			
Base	Glass fiber reinforced polyester			
Movable Contactor	Phosphor bronze w/gold plating* over nickel			
Stationary Contacts	Copper with gold plating* over nickel			
Terminals	Brass with tin-lead plating			
* Gold plating thickne	ess is 1 micron minimum.			

### **SOLDERING & WASHING**

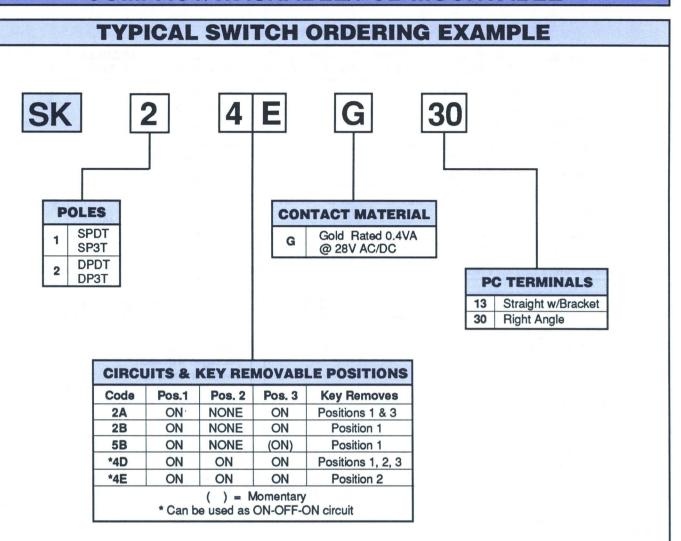
### Soldering Time & Temperature Limits

3 seconds @ 350°C 5 seconds @ 270° 5 seconds @ 250°C for plated-through holes

### Washing Recommendation

Alcohol based cleaning solutions are recommended.

## COMPACT/WASHABLE/PCB MOUNTABLE



## DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (SK24EG30)

## **SERIES SK KEYLOCK**



## COMPACT/WASHABLE/PCB MOUNTABLE

POLES & CIRCUITS								
POLE & THROW	MODEL NUMBER	CIRCUIT POSITIONS	CONNE POS 1	CTED TERI POS 2	MINALS POS 3	KEY REMOVABLE	ANGULAR THROW	LOCK POSITION
SPDT	SK12A SK12B SK15B	ON-NONE-ON ON-NONE ON ON-NONE-(ON)	C1-1	6	C1-2	Positions 1 & 3 Position 1 Position 1	90°	POS I
DPDT	SK22A SK22B SK25B	ON-NONE-ON ON-NONE-ON ON-NONE-(ON)	C1-1, C2-4		C1-2, C2-5	Positions 1 & 3 Position 1 Position 1	90°	POS I
SP3T	SK14D SK14E	ON-ON-ON ON-ON-ON	C1-1	C1-2	C1-3	Positions 1, 2, 3 Position 2		POS 1 @ 3
DP3T	SK24D SK24E	ON-ON-ON ON-ON-ON	C1-1, C2-4	C1-2 C2-5	C1-3 C2-6	Positions 1, 2, 3 Position 2	45°	POSI O 3
Terminal nu	mbers are not act	ually on the switch.			● = Key F	Removable	19.10	Key-end View

## **KEY REMOVABLE**

- Positions 1 & 3 (90° angular throw)
- Position 1 B (90° angular throw)
- Positions 1, 2, & 3 (45° angular throw) D
- Position 2 (45° angular throw)

## **CONTACT MATERIAL**

Gold G Rated 0.4VA @ 28 V AC

### **DISPOSABLE BOOT**

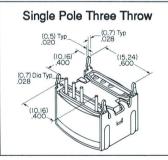
One polyvinyl chloride disposable boot is packaged with each switch. In order to place the boot on the switch before washing, the key must first be removed.

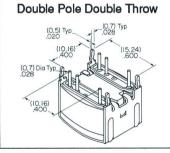


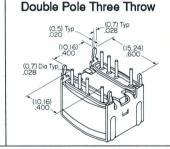
## PC TERMINALS

13 Straight PC Terminals with Bracket

## Single Pole Double Throw (0.7) Dia Typ\_ .028 (10.16)

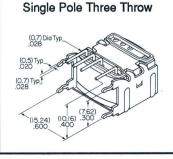


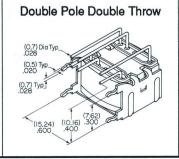


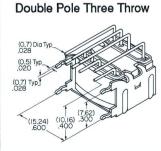


30 **Right Angle PC Terminals** 

Single Pole Double Throw (0.7) Typ)







## COMPACT/WASHABLE/PCB MOUNTABLE

## **KEYS FOR STRAIGHT & RIGHT ANGLE MOUNT MODELS**

## AT4080 Plastic Handled (standard)

Material: Bright nickel/brass alloy with ABS resin handle

2 keys supplied with each switch.

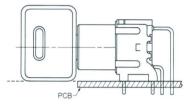


AT4079 All Metal (optional)

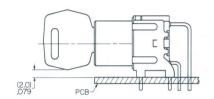
Material: Bright nickel/brass alloy

Contact factory if metal keys needed.



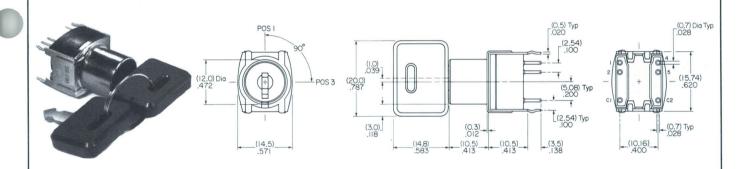


Suitable for all Straight PCB mount and for Right Angle PCB mount where clearance for key is obtainable.



Suitable for all Straight PCB mount and all Right Angle PCB mount.

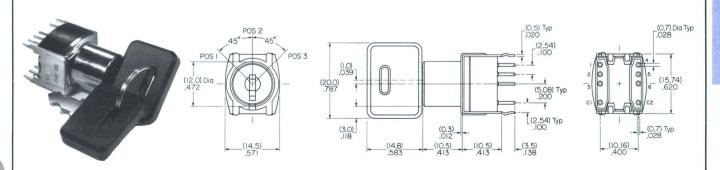
## Straight PC Terminals with Bracket/Single Pole Double Throw & Double Pole Double Throw



SK12AG13 Model Shown

Single pole models have only terminals 1, 2, & C1.

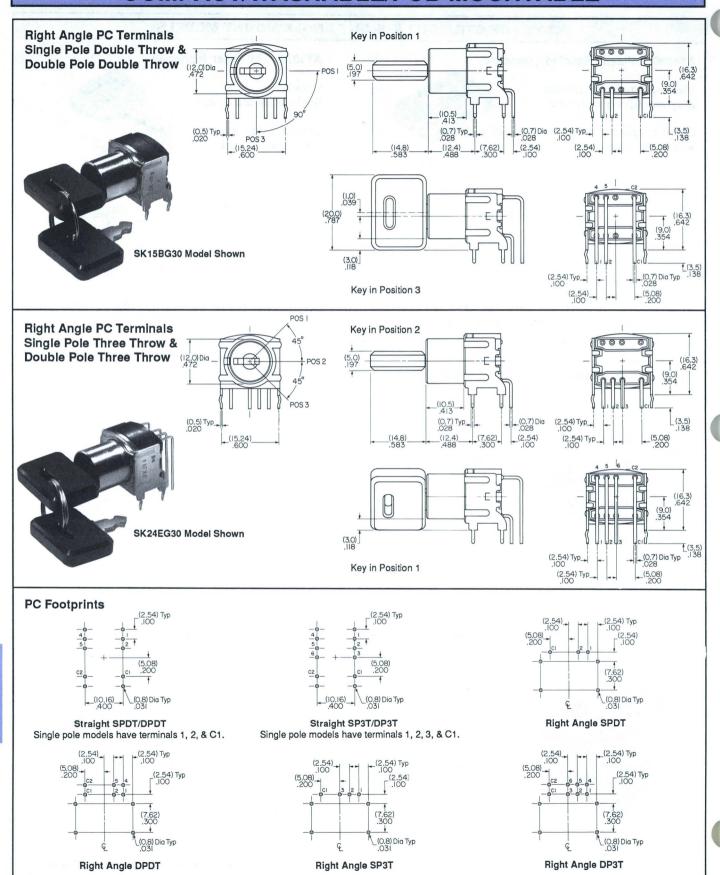
## Straight PC Terminals with Bracket/Single Pole Three Throw & Double Pole Three Throw



SK24DG13 Model Shown

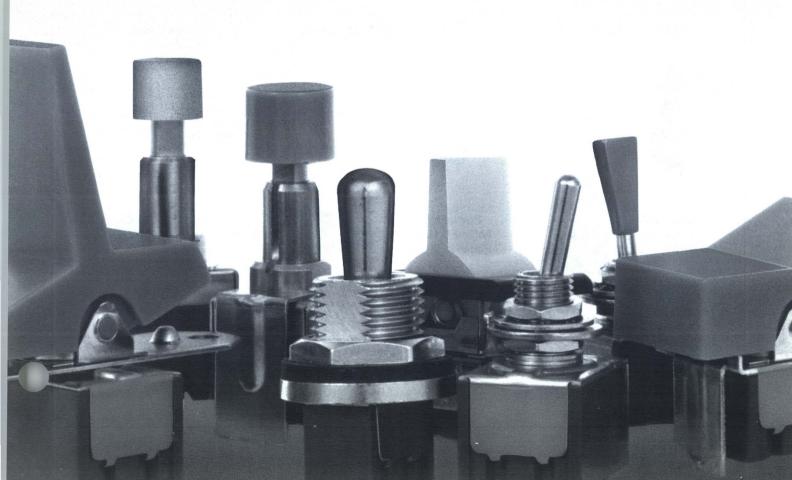
Single pole models have only terminals 1, 2, 3, & C1.

## COMPACT/WASHABLE/PCB MOUNTABLE



## SUBMINIATURE SWITCHES

- TOGGLES ROCKERS
- PUSHBUTTONS SLIDES



## nkk° SERIES M

## SUBMINIATURE/MULTI-FUNCTION

## STANDARD FEATURES

NKK customers have the advantage. They receive distinctive switch features at no charge. The characteristics described on the following distinctive features page are furnished as standard. When the customer places an order, there is no need to identify and request these features in addition to the basic switch desired and there are no charges added to obtain the features. NKK thus gives its customers simplicity of ordering and economy along with such features as antirotation, high torque bushings, antijamming, and epoxy seal.

## **ORGANIZATION OF SERIES M SECTION**

Due to the extensive size of the M Series, the infomation is organized into five major sections for toggles, rockers, pushbuttons, snap-action pushbuttons, and slides. The first four sections are further divided into subsections by mounting type.



Unbracketed Pages M3 - 13

## Toggles



Bracketed PC Mount Pages M14 - 17



Angle PC Mount Pages M18 - 22

### **Rockers**



Flat Frame Mount Pages M23 - 31



Snap-in Mount Pages M32 - 41



Bracketed & Angle PC Mount Pages M42 - 50

### MB2000 Pushbuttons



Bushing Mount Pages M51 - 57



Pages M58 - 63

Bracketed &

Angle PC Mount



Large Bushing Mount Pages M64 - 68

### **MB2400 Light Touch Pushbuttons**



Bushing Mount Pages M69 - 74



Solder Lug Pages M83 - 86

MS Slides





10 241

Snap-in Mount Pages M80 - 82

Bracketed & Angle PC Mount Pages M83 - 88





Illuminated Pages M89 - 90

**Rockers** 

## **NKK®**

## SERIES M

## SUBMINIATURE/MULTI-FUNCTION

## **DISTINCTIVE FEATURES**

Antirotation feature is standard on noncylindrical levers.

Antijamming design on toggle switches protects contacts from damage due to excessive downward force on the actuator.

High torque bushing construction prevents rotation or separation from frame during installation.

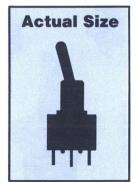
Stainless steel frame resists corrosion.

Patented silver contacts of specially composed alloy for hardness.

High insulating barriers, formed in \_\_\_\_ the molded diallylphthalate case, increase isolation of circuits in multipole devices and provide added protection to contact points.

Epoxy sealed terminals prevent entry of \_ solder flux and other contaminants.

Prominent external insulating barriers increase insulation resistance and dielectric strength.



Interlocked actuator block prevents switch failure due to biased lever movement.

Longer center solder lug terminal \_ simplifies wiring and soldering.

Clinching of the frame to the case well above the base and terminals provides 1500V dielectric strength.

## NKK° SERIES M

## SUBMINIATURE/MULTI-FUNCTION

## **APPLICATION DATA**

M Series is the flagship of the NKK product line. This series of subminiature switches is NKK's broadest, most widely accepted line. It is the series that established NKK as a world leader in the subminiature electronic switch industry.



## **NKK** SERIES M TOGGLE SWITCHES

## SUBMINIATURE/MULTI-FUNCTION

## **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

6A @ 125V AC & 3A @ 250V AC

(Resistive Load)

6A @ 30V DC

0.4VA maximum @ 28V AC/DC maximum

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance:

10 milliohms maximum for silver 20 milliohms maximum for gold

Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1.000V AC minimum between contacts

1,500.V AC minimum between contacts and case

Mechanical Life:

100,000 operations minimum

50,000 operations minimum for flat, locking, & splashproof devices

**Electrical Life:** 

25,000 operations minimum for silver 50,000 operations minimum for gold

**Ambient Temp Range:** 

-15°C through +85°C (+5°F through +185°F) Optional low temperature lubricant available

Toggle Angle of Throw:

Nominal Operating Force:

400 grams for Single Pole 450 grams for Double Pole 700 grams for Three Pole 800 grams for Four Pole

MATERIALS & FINISHES				
Brass with chrome plating				
Brass with nickel plating				
Stainless steel				
Diallylphthalate resin (UL 94V-0)				
Phosphor bronze with silver or gold plating*				
Silver alloy (code W); or silver alloy with gold plating* over nickel (code A); or copper with gold plating* over nickel (code G)				
Silver with silver plating (code W); or silver with gold plating* over nickel (code A); or copper or brass with gold plating* over nickel (code G)				
Copper or brass with silver plating; or copper or brass with gold plating over nickel				

### **BIAS GUARD**

Gold plating on contacts is 1 micron minimum.

When the lever is pushed in a diagonal direction instead of the mechanism's direction of operation, biased movement is transmitted to the actuator block and causes misalignment of contacts. However, internal construction of the M Series case prevents this biased movement.

### ANTIROTATION DESIGN

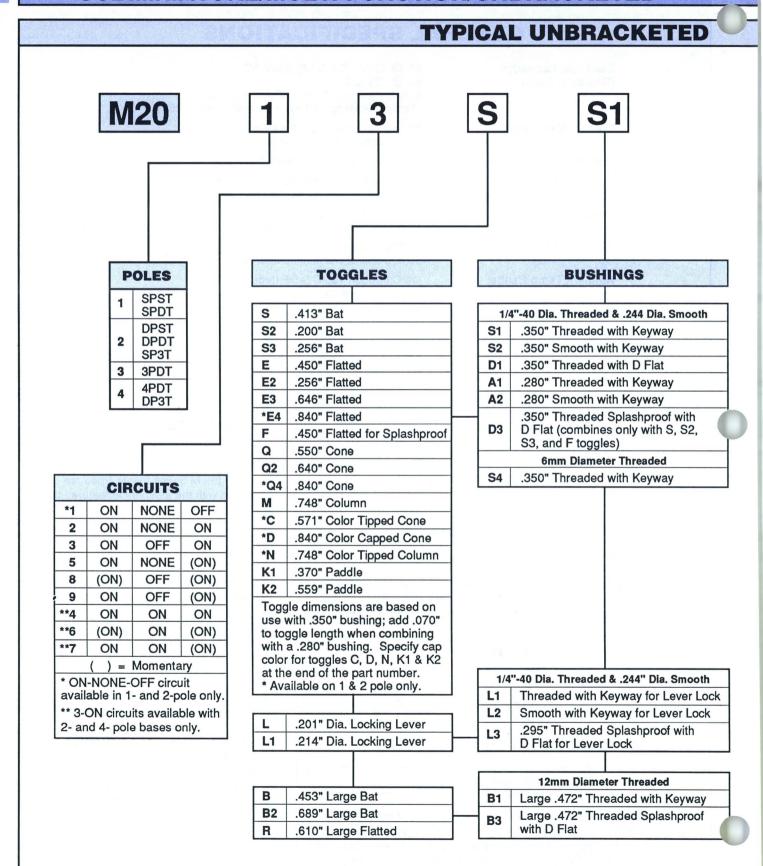
Three of the M Series toggle types are designed with the antirotation feature: the flatted toggles which are coded E, E2, E3, E4, F and R; the locking levers L and L1; and the snap top toggles which receive the paddle cap and which are coded K1 and K2.

The bottom portion of all these toggles has two flatted sides which fit into a complementary opening inside the bushing. Turning of the toggle is prevented by the specially designed fit of these two structures.

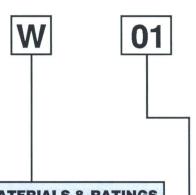


## **NKK** SERIES M TOGGLE SWITCHES

## SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED



## **SWITCH ORDERING EXAMPLE**



## **CONTACT MATERIALS & RATINGS**

w	Silver Rated 6A @ 125V AC & 3A @ 250V AC	
A	Gold over Silver Rated 6A @ 125 AC & 0.4VA max @ 28V AC/DC max	
G	Gold Rated 0.4VA max @ 28V AC/DC max	

## **OPTIONAL CAPS**

В	For S Bat Toggle
С	Conical Cap for S Bat Toggle
R	For B Toggle
٧	For B2 Toggle

## **CAP COLORS**

Α	Black					
В	White					
С	Red					
E	Yellow					
F	Green					
G	Blue					

## **TERMINALS** 01 Solder Lug 02 Quick Connect .250" Straight PC 03

05 .425" Wirewrap 06 .750" Wirewrap .964" Wirewrap 07

1.062" Wirewrap

**DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (M2013SS1W01)** 

**SERIES M TOGGLE** 

.413" Bat Toggle SPDT ON-OFF-ON Circuit Solder Lug Terminals.

1/4"-40 Diameter .350" Threaded Bushing with Keyway

Silver Contacts with 6 Amp & 3 Amp Rating

**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

08

## **NKK** SERIES M TOGGLE SWITCHES

## SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED

		P	OLES AND CIRCUITS	ski dumen	
		IUMBERS			
POLE & THROW	MODEL	Down	Center	Up	SCHEMATICS
SPST	M2011	ON	NONE	OFF	92 (COMM)
CONNECTED	TERMINALS	2–3	OPEN	OPEN	/ •3
SPDT	M2012 M2013 M2015* M2018 M2019*	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	9.2 (COMM) 1.0 3.3
CONNECTED	TERMINALS	2–3	OPEN	2–1	
DPST	M2021	ON	NONE	OFF	2 (COMM) 5 • 6
CONNECTED	TERMINALS	2-3 5-6	OPEN	OPEN	/ •3 / •6
DPDT	M2022 M2023 M2025* M2028 M2029*	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	92 (COMM) 59 19 93 49 96
CONNECTED	TERMINALS	2-3 5-6	OPEN	2-1 5-4	
3PDT	M2032 M2033 M2035 M2038 M2039	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	92 59 (COMM) 98
CONNECTED	TERMINALS	2-3 5-6 8-9	OPEN	2-1 5-4 8-7	
4PDT	M2042 M2043 M2045 M2048 M2049	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	92 59 (COMM) 98 II9
CONNECTED	TERMINALS	2–3 5–6 8–9 11–12	OPEN	2–1 5–4 8–7 11–10	
•	* Reverse circuit	s available upon request.	Terminal numbers are not a	ctually on switches.	
SP3T	M2024 M2026 M2027	ON (ON) ON	ON ON ON	ON (ON) (ON)	The SP3T model is a conversion of the DPDT.
CONNECTED TERMINALS W/O EXTERNAL CONNECTIONS		2–3 5–6	2–3 5–4	2–1 5–4	External (cour)  External (cour)  Common (cour)  (cour) - (cour)
SCHEMATIC V EXTERNAL CO		External Connection 5 (in) 5 (in) 5 (in) 6 (out)	Esternal Connection 5 (2(n) 5 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	External Connection 5 2(in) 5 1(out) 3 4(out) 6(out)	The DP3T model is a conversion of the 4PDT.
DP3T	M2044 M2046 M2047	ON (ON) ON	ON ON ON	ON (ON) (ON)	External (in) + (out) + (out) Common Common (in) + (out) + (in) + (out) Common (in) + (out) + (in) + (out) + (out) + (out)
CONNECTED W/O EXTERNA CONNECTION	AL	2–3 5–6 8–9 11–12	2–3 5–4 8–9 11–10	2–1 5–4 8–7 11–10	(out) + (out) + (out)
SCHEMATIC V EXTERNAL CO		External Connection	External Connection - External Connection - 2(in) 5 8 (in) 11	External Connection— 2 (in) 5 8 (in) 1   1   1   1   1   1   1   1   1   1	The external connections must be made during field installation.

## **SERIES M TOGGLE SWITCHES**

## SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED

## **TOGGLES**

All the toggles are brass with a standard finish of bright chrome; satin chrome and black finishes are available on request to the factory. Toggle dimensions are based on combination with the .350" bushing; add .070" to toggle length when combined with the .280" bushing.



.200" Bat



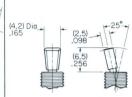
.256" Bat



E .450" Flatted

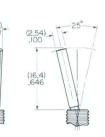


.256" Flatted

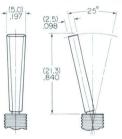




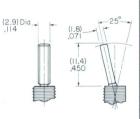
.646" Flatted



.840" Flatted (available on 1 & 2-pole only)



.450" Flatted for Splashproof



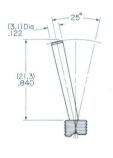
.550" Cone



Q2 .640" Cone



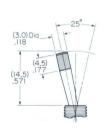




.748" Column

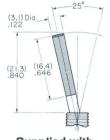


.571" Color Tipped Cone (available on 1 & 2-pole only)



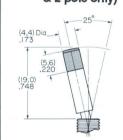
Supplied with CapAT445 Polycarbonate

D .840" Color Capped Cone (available on 1 & 2-pole only)



Supplied with Cap AT460 Polyethylene



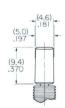


Supplied with Cap AT441 Polypropylene

K1

.370" Paddle

Supplied with Cap AT467 Nylon

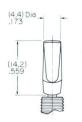


(2.4) 25° (10.3) (10.3) (406



## K2

.559" Paddle Supplied with Cap AT468 Nylon







Colors Available:

A Black

**B** White

C Red

E Yellow

F Green

G Blue

(H Gray is also available for AT467 & AT468)

For toggles C, D, N, K1 & K2 the cap color code must be specified at the end of the part number.

## **NHK® SERIES M TOGGLE SWITCHES**

## SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED

## **TOGGLES**

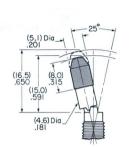
Locking toggles are brass with chrome plating, while the standard caps supplied with these toggles are nickel plated. A color code must be specified at the end of the part number to order the optional colored or brushed aluminum caps. Locking toggles can be combined only with L1, L2, and L3 bushings.



Supplied with Cap AT427

Standard: Nickel **Plated Brass** 

Optional: Colored or **Brushed Aluminum** 

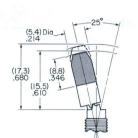


.214" Dia. Locking Lever

Supplied with Cap AT076

Standard: Nickel **Plated Brass** 

Optional: Colored or Brushed Aluminum



Colors & Finish for Optional Aluminum:

A Black

C Red

G Blue

9 Brushed Aluminum

## **LOCKING MECHANISM**







Circuit Codes 7 and 9 2 Positions Lock



Circuit Codes 3 and 4



Large toggles are brass with a standard finish of bright chrome; satin chrome and black finishes are available on request to the factory. These large toggles can be combined only with 12mm bushings.

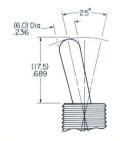


.453" Large Bat



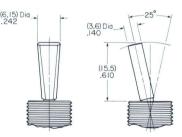


.689" Large Bat





.610 Large Flatted



### **OPTIONAL CAPS**



### **AT415** For S Bat Toggle

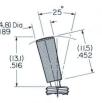
Polyethylene





**AT444 Conical Cap for** S Bat Toggle

Polyethylene



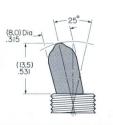
A Black

**B** White



**AT434** For B Toggle

Vinyl Chloride



C Red E Yellow

**AT406** For B2 Toggle

Vinyl Chloride



F Green

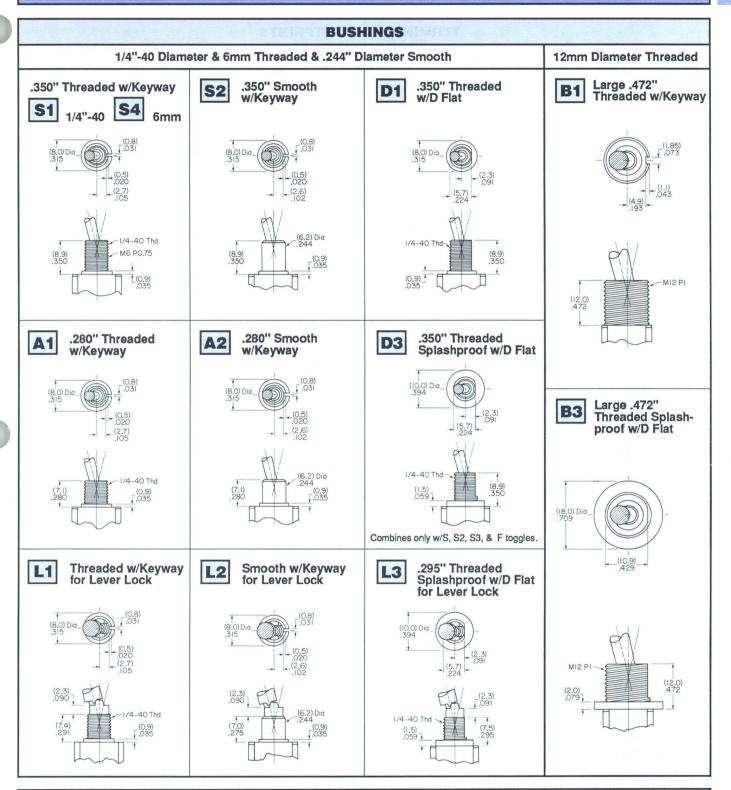
G Blue

Colors Available:

M<sub>10</sub>

## **NKK** SERIES M TOGGLE SWITCHES

## SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED



## **CONTACT MATERIALS & RATINGS**



Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC



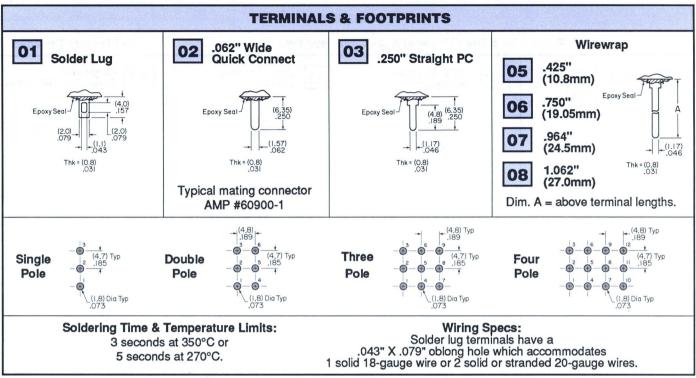
Gold over Silver Rated 6A @ 125V AC & 0.4VA maximum @ 28V maximum AC/DC

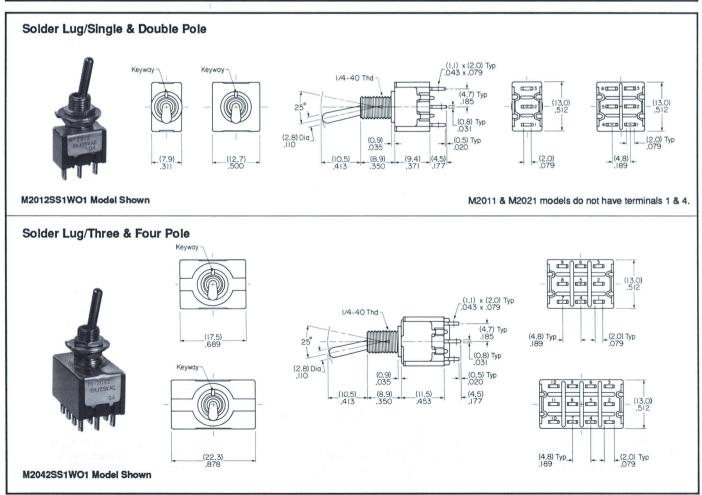


Gold over Brass or Copper Rated 0.4VA maximum @ 28V maximum AC/DC

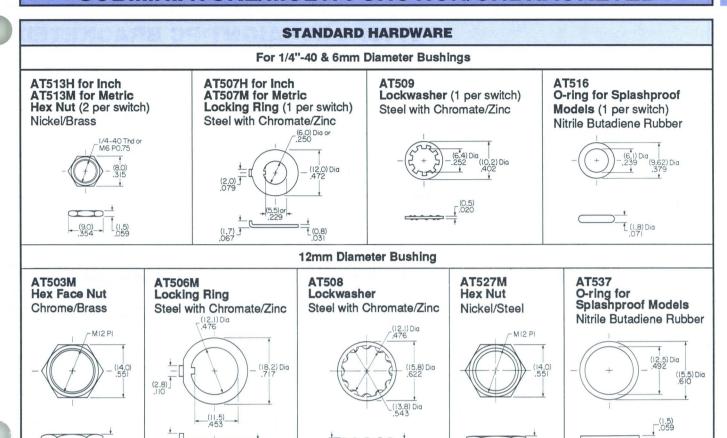
## **NKK** SERIES M TOGGLE SWITCHES

## SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED





# SUBMINIATURE/MULTI-FUNCTION/UNBRACKETED

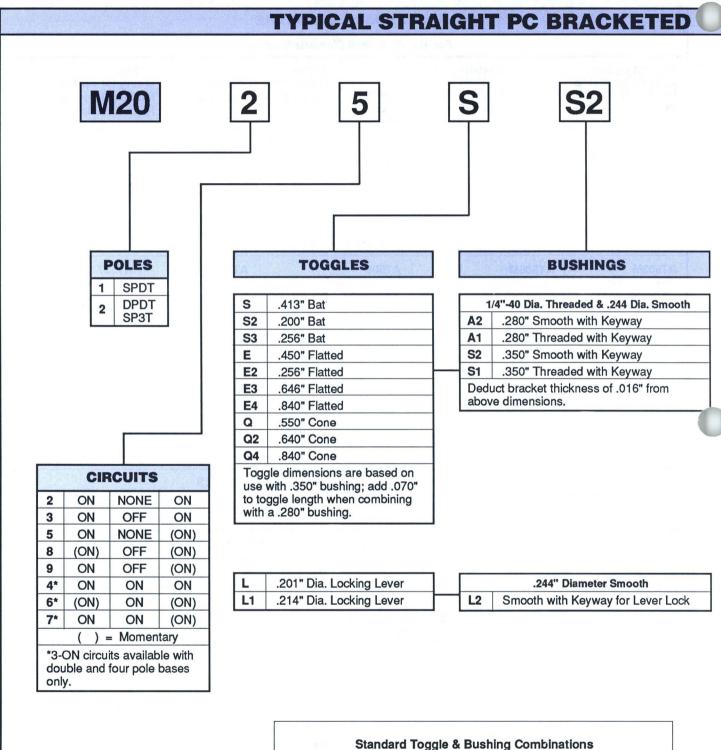


### **OPTIONAL HARDWARE & ACCESSORIES**

Various optional knurled or dress nuts and ON-OFF plates are available, as illustrated in the hardware & accessories sections.

MAX	IMUM EFFE	CTIVE PANE	L THICKNESS	& CUTOUTS	N
	For 1	/4"-40 & 6mm D	iameter Bushings		
Threaded Length  ▼ Hardware ➤	Standard	W/O Bottom Hex Nut	W/O Locking Ring	W/O L. Ring & Bottom Hex Nut	W/One Hex Nut & O-ring (Splashproof)
.315" Panel .245" Thickness:	2.6mm/.102" 0.8mm/.031" 1.2mm/.047"	4.7mm/.185" 2.9mm/.114" 3.2mm/.126"	3.4mm/.134" 1.6mm/.063" 2.0mm/.079"	5.5mm/.216" 3.7mm/.146" 4.0mm/.157"	4.9mm/.193" Not Available 3.5mm/.138"
Cutout:		(6.5) Dia .256 (6.5) .256 1 2.2) Dia	(6.5) Dia 2.256 (5.6) - (2.20) - (0.6) - (0.6)	-(6.5) Dia	- (5,8) - (2,28) - (6,5) Dia - (256)
		For 12mm Diam	eter Bushing		
.393" Panel Thickness:	5.5mm/.216"	7.5mm/.295"	6.5mm/.256"	8.5mm/.335"	6.5mm/.256"
Cutout:	- (*)	(12.5) Dia .492 (9.0) .354 (3.0) Dia	(12.5) - (492 - (11.5) - (11.5) - (15.5) - (15.5) - (15.5) - (15.5)		- (11,1) - (11,1) - (12,5) (12,5) .492

# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT



For straight PC bracketed switches, the standard toggle and bushing combinations are SS2, S2A2, S3S2, ES2, and LL2.

# **SWITCH ORDERING EXAMPLE**



OPTI	ONAL	CAPS

В	For S Bat Toggle
С	Conical Cap for S Bat Toggle

CAP COLORS		
Α	Black	
В	White	
C	Red	
Е	Yellow	

Green

Blue

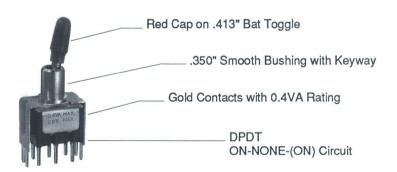
G

TERMINALS		
	With Bracket	
13	.250" Straight PC with .465" Bracket	
15	.425" Straight PC with .630" Bracket	
17	.964" Straight PC with 1.150" Bracket	
With Reinforced Bracket		
23	.250" Straight PC with .465" Bracket	
25	.425" Straight PC with .630" Bracket	
26	.750" Straight PC with .953" Bracket	

**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

## **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (M2025SS2G13-BC)**

**SERIES M TOGGLE** 



.250" Straight PC Terminals with Bracket .465" Long

# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT

## POLES, CIRCUITS, TOGGLES, BUSHINGS & CAPS

Details regarding the poles and circuits are given in a chart in the previous unbracketed section. That same section also contains detailed information for the toggles, caps, and bushings. For bushing lengths on these bracketed models deduct .016" from the dimensions given in the previous detail drawings.

Details regarding the contact materials and ratings, terminals, mounting information, and full switch drawings specific to bracket mount devices are in this section.

### **CONTACT MATERIALS & RATINGS**

Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC

Gold over Silver Rated 6A @ 125V AC & 0.4VA max @ 28V AC/DC max

G Gold Rated 0.4VA maximum @ 28V AC/DC maximum

### **SOLDERING LIMITS**

**Time & Temperature Limits** 

3 seconds at 350°C

5 seconds at 270°C

### **TERMINALS**

Straight PC Mount with Bracket

Straight PC Mount with Reinforced Bracket

13

15

17

23

25

26

.250" Terminal w/.465" Bracket

.425" Terminal w/.630" Bracket

.964" Terminal w/1.150" Bracket

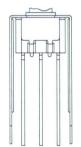
.250" Terminal w/.465" Bracket

.425" Terminal w/.630" Bracket

.750" Terminal w/.953" Bracket

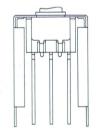












### THREADED BUSHING MOUNT

If a threaded bushing is selected, the switch can be mounted in a panel cutout with the standard hardware provided: AT513, AT507, and AT509. The maximum effective panel thickness and cutouts are shown below. Detailed illustrations of the optional hardware and accessories appear at the end of the catalog.

### **MAXIMUM EFFECTIVE PANEL THICKNESS & CUTOUTS** For 1/4"-40 Diameter Bushings Threaded Length W/O Bottom W/O Locking W/O Locking Ring & Bottom Hex Nut Hardware ➤ Standard Hex Nut Ring 3.3mm/.130" .315" **Panel** 4.8mm/.189" 4.1mm/.161" 5.6mm/.220" .245" Thickness: 1.9mm/.076" 3.43mm/.135" 2.7mm/.107" 4.2mm/.166" (6.5) Dia .256 **Cutout:**

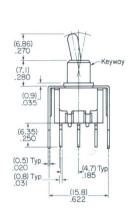
# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT

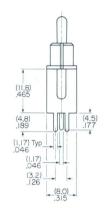
## Straight PC with Bracket/Single & Double Pole

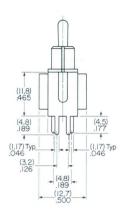


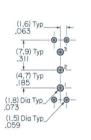
## M2012S2A2G13 Model Shown

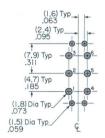
Terminal Code	Terminal Length	Bracket Length	
13	.250" (6.4mm)	.465" (11.8mm)	
15	.425" (10.8mm)	.630" (16.0mm)	
17	.964" (24.5mm)	1.150" (29.2mm)	











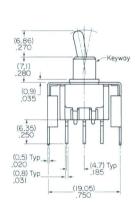
M2011 & M2021 models do not have terminals 1 & 4.

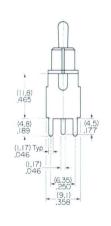
## Straight PC with Reinforced Bracket/Single & Double Pole

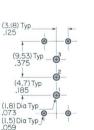


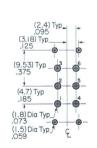
### M2012S2A2G23 Model Shown

Terminal Code	Terminal Length	Bracket Length	
23	.250" (6.4mm)	.465" (11.8mm)	
25	.425" (10.8mm)	.630" (16.0mm)	
26	.750" (19.05mm)	.953" (24.2mm)	



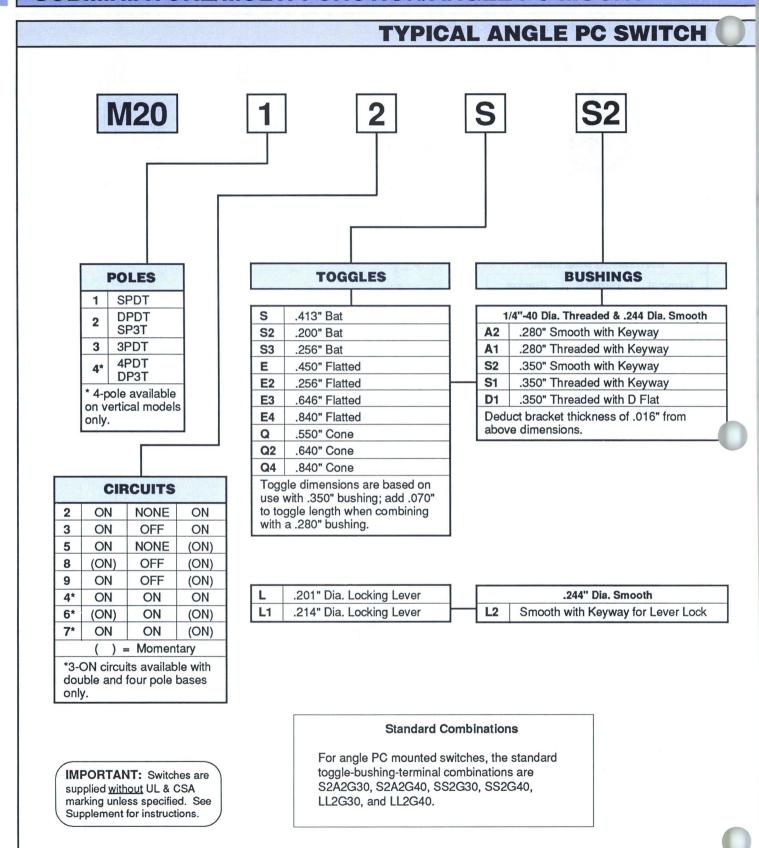






M2011 & M2021 models do not have terminals 1 & 4.

# SUBMINIATURE/MULTI-FUNCTION/ANGLE PC MOUNT



# **ORDERING EXAMPLE CAP COLORS CONTACT MATERIALS & RATINGS OPTIONAL CAPS** Silver Rated 6A @ 125V AC & Black For S Bat Toggle 3A @ 250V AC B White Conical Cap for C Gold over Silver Rated 6A @ 125V AC S Bat Toggle Red C A & 0.4VA max @ 28V AC/DC max E Yellow Gold Rated 0.4VA max @ 28V F Green AC/DC max Blue **TERMINALS** .150" Right Angle PC (1-3 Pole) 30 Right Angle PCB (1 Pole & 0.4VA 32 Rating Only) **DESCRIPTION FOR TYPICAL** .150" Vertical PC **ORDERING EXAMPLE (M2012SS2G40-BA)** 40 (1-4 Pole) .100" Vertical PC **SERIES M TOGGLE** 45 (1-4 Pole) SPDT Gold Contacts with 0.4VA Rating ON-NONE-ON Circuit .350" Smooth Bushing with Keyway Black Cap on .413" Bat Toggle \_ Vertical PC Terminals with .150" Terminal Spacing

# SUBMINIATURE/MULTI-FUNCTION/ANGLE PC MOUNT

## **POLES, CIRCUITS, TOGGLES, BUSHINGS & CAPS**

Details regarding the poles and circuits are given in a chart in the unbracketed section. That same section also contains detailed information for the toggles, caps, and bushings. For bushing lengths on these bracketed models deduct .016" from the dimensions given in the previous detail drawings.

Details regarding the contact materials and ratings, terminals, mounting information, and full switch drawings specific to angle mount devices are in this section.

### **CONTACT MATERIALS & RATINGS**

Silver over Silver Rated 6A W @ 125V AC & 3A @ 250V AC Gold over Silver Rated 6A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum

Gold Rated 0.4VA maximum @ 28V AC/DC maximum

## **TERMINALS & FOOTPRINTS**

.150" Right Angle PC

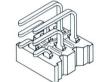


Right Angle PCB 32 with Reverse Circuit (1 Pole & 0.4VA Rating Only)



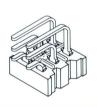
**Double Pole** 

.150" Vertical PC (1-4 Pole)



.100" Vertical PC 45 (1-4 Pole)

30



Single Pole

Three Pole

Four Pole

### THREADED BUSHING MOUNT

If a threaded bushing is selected, the switch can be mounted in a panel cutout with the standard hardware provided: AT513, AT507, and AT509. The maximum effective panel thickness and cutouts are shown below. Detailed illustrations of the optional hardware and accessories appear at the end of the catalog.

		For 1/4"-40 D	iameter Bushing	S	
Threaded L	ength Hardware ➤	Standard	W/O Bottom Hex Nut	W/O Locking Ring	W/O L. Ring & Bottom Nut
.315" .245"	Panel Thickness:	3.3mm/.130" 1.9mm/.076"	4.8mm/.189" 3.43mm/.135"	4.1mm/.161" 2.7mm/.107"	5.6mm/.220" 4.2mm/.166"
	Cutout:		(6.5) Dia -256 (6.5) -256 (2.2) Dia .087	(6.5) Dia -256 -(5.6) -(5.6) -220 -220 -220 -220	- (6.5) Dia .256

### **SOLDERING LIMITS**

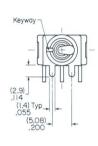
3 seconds at 350°C

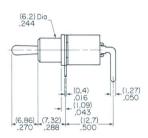
5 seconds at 270°C.

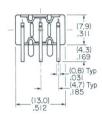
# SUBMINIATURE/MULTI-FUNCTION/ANGLE PC MOUNT

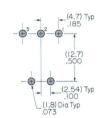
## .150" Right Angle PC/Single Pole







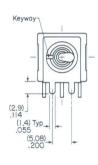


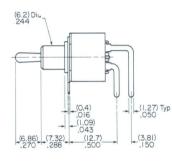


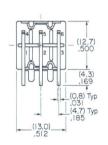
M2012S2A2G30 Model Shown

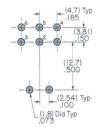
## .150" Right Angle PC/Double Pole







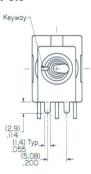


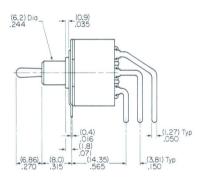


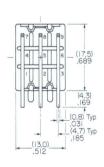
M2022S2A2G30 Model Shown

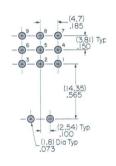
## .150" Right Angle PC/Three Pole







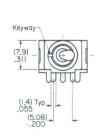


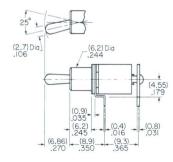


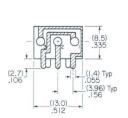
M2032S2A2G30 Model Shown

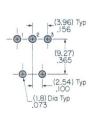
### PCB/Single Pole





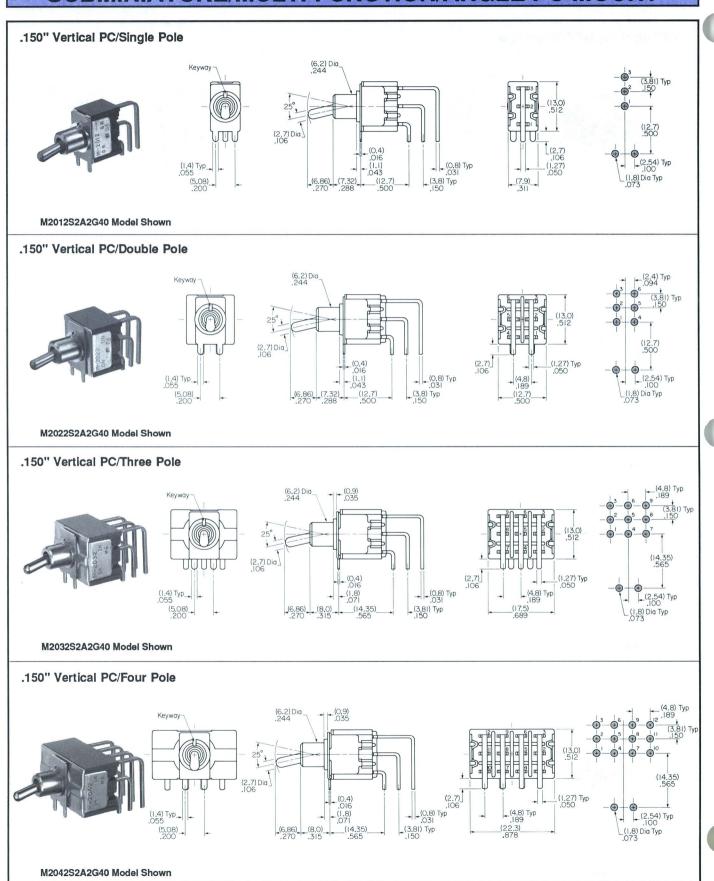






M2012S2A2G32 Model Shown

# SUBMINIATURE/MULTI-FUNCTION/ANGLE PC MOUNT



# SUBMINIATURE/MULTI-FUNCTION

# **M SERIES ROCKERS**

The rocker section is divided into subsections to reflect the three different mountings shown. There are two distinct sizes of rockers and paddles and a variety of terminal options which combine with each mounting type.

A Typical Ordering Example is given for each type of mounting and outlines the options available for that particular mounting. Detail pages following ordering examples provide additional information regarding the options outlined and accessories available.

## Flat Frame Mount (Codes TN & TY)

Flat frame devices are available in two sizes which accommodate either small or large rockers or paddles. Solder lug, quick connect, straight PC and wirewrap terminals may be combined with either of these frames.

Pages M23 - M31



## Snap-in Mount (Code TJ)

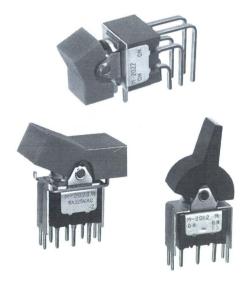
Snap-in frames accept the .453" wide rocker or paddle or the false illuminated rocker. Solder lug, quick connect, straight PC or wirewrap terminal options are available. An optional bezel with or without LED is offered.

Pages M32 - M41



In the bracketed PC mount subsection, separate ordering examples are given for small and large actuators. Small rockers and paddles may be combined with straight, right angle or vertical PC terminals. The large rocker or paddle may be combined with straight PC terminals only.

Pages M42 - M50



# SUBMINIATURE/MULTI-FUNCTION

# **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

6A @ 125V AC & 3A @ 250V AC

(Resistive Load)

6A @ 30V DC

0.4VA maximum @ 28V AC/DC maximum

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

10 milliohms maximum for silver

20 milliohms maximum for gold

Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1.500V AC minimum between contacts and case

Mechanical Life:

50,000 operations minimum

**Electrical Life:** 

25,000 operations minimum for silver 50,000 operations minimum for gold

**Ambient Temp Range:** 

-15°C through +85°C (+5°F through +185°F) Optional low temperature lubricant available

Toggle Angle of Throw:

25°

MATERIALS & FINISHES		
Actuator Clip	Beryllium alloy with nickel plating	
Mounting Frame	Stainless steel	
Frame	Stainless steel	
Case	Diallylphthalate resin (UL 94V-0)	
Movable Contactor	Phosphor bronze with silver or gold plating*	
Movable Contacts	Silver alloy (code W); or silver alloy with gold plating* over nickel (code A); or copper with gold plating* over nickel (code G)	
Stationary Contacts	Silver with silver plating (code W); or silver with gold plating* over nickel (code A); or copper or brass with gold plating* over nickel (code G)	
Terminals	Copper or brass with silver plating; or copper or brass with gold plating over nickel	

### **LEGENDS**

Several methods of placing legends on the face of the rocker are available: pad printing, hot stamping and engraving. The preferred method is pad printing due to the increased legend life obtained. Details regarding these methods may be obtained from the factory.



### **UL RECOGNITION & CSA CERTIFICATION**

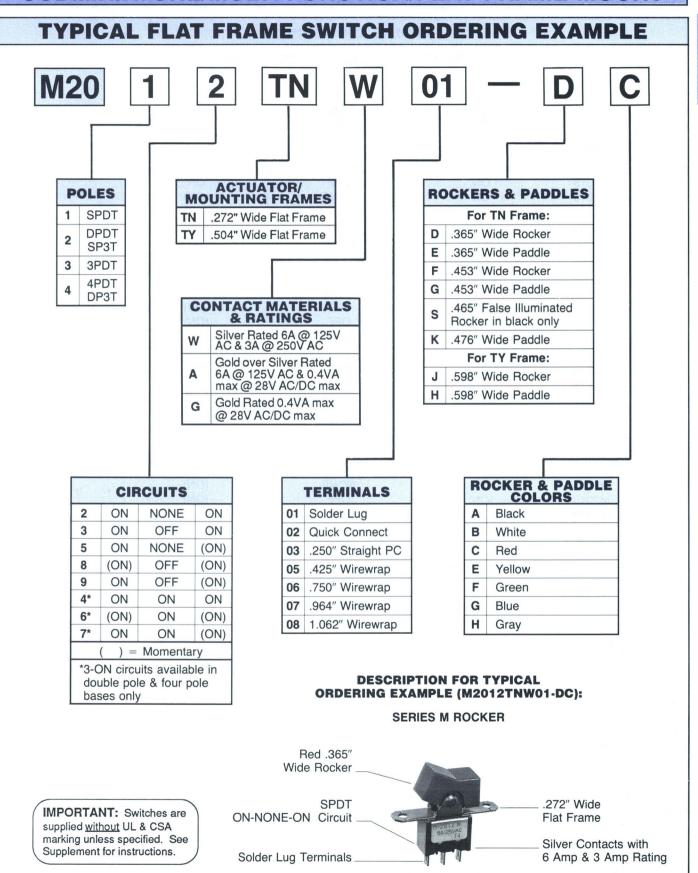
Models recognized by Underwriters Laboratories Inc. and certified by Canadian Standards Association at ratings of 6A @ 125V AC, 3A @ 250V AC, and 0.4VA @ 28V AC/DC are listed in the Supplement at the back of this catalog.

UL File No. E44145

Gold plating on contacts is 1 micron minimum.

CSA File Nos. LR23535 and LR56017

# SUBMINIATURE/MULTI-FUNCTION/FLAT FRAME MOUNT



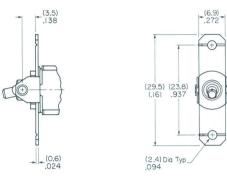
# SUBMINIATURE/MULTI-FUNCTION/FLAT FRAME MOUNT

		P	OLES AND CIRCUITS	S	
		ROCKER	POSITION & TERMINAL N	NUMBERS	
	1 1	gar 10°	( ) = Momentary		
		Down	Center	Up	
POLE & THROW	MODEL		Rating Markings on Opposite Side		SCHEMATICS
SPDT	M2012 M2013 M2015* M2018	ON ON ON (ON)	NONE OFF NONE OFF	ON ON (ON) (ON)	9 2 (COMM)
CONNECTED	M2019*	ON 2–3	OFF OPEN	(ON) 2–1	
DPDT	M2022 M2023 M2025* M2028 M2029*	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	92 (COMM) 59
CONNECTED	1	2–3 5–6	OPEN	2–1 5–4	
3PDT	M2032 M2033 M2035 M2038 M2039	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	92 59 (COMM) 98
CONNECTED	TERMINALS	2-3 5-6 8-9	OPEN	2-1 5-4 8-7	
4PDT	M2042 M2043 M2045 M2048 M2049	ON ON ON (ON) ON 2–3 5–6	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	92 59 (COMM) 98 119 1 • 3 4 • 6 7 • 9 10 • 1
		8-9 11-12 on request. Terminal numbers are	not actually on the switch	8–7 11–10	
SP3T	M2024 M2026 M2027	ON (ON) ON	ON ON ON	ON (ON) (ON)	The SP3T model is a conversion of the DPDT.
CONNECTED W/O EXTERN CONNECTION	AL	2–3 5–6	2–3 5–4	2–1 5–4	External Common (out)
SCHEMATIC \ EXTERNAL C	WITH ONNECTIONS	External Connection— 2(in) 5 1(out) 3 4(out) 6(out)	External Connection 7 2(in) 5 1(out) 3 4(out) 6(out)	External Connection - 2(in) 5 5 1(out) 3 4(out) 6(out)	The DP3T model is a conversion of the 4PDT.
DP3T	M2044 M2046 M2047	ON (ON) ON	ON ON ON	ON (ON) (ON)	Externol (out) (out)  Externol (out) (out)  Externol (out) (out) (out)  Conn  Conn  Out (out) (out)  Externol (out) (out)  Externol (out) (out)  Externol (out) (out)
CONNECTED W/O EXTERN CONNECTION	AL	2–3 5–6 8–9 11–12	2–3 5–4 8–9 11–10	2–1 5–4 8–7 11–10	(out) (out) (out)
SCHEMATIC \ EXTERNAL C	WITH ONNECTIONS	External Connection	External Connection 5	External Connection External Connection 8 (in) 11 (out) 3 4(out) 6(out) 7(out) 9 10(out) 12(out)	The external connections must be made during field installation.

# SUBMINIATURE/MULTI-FUNCTION/FLAT FRAME MOUNT

## **ACTUATOR/MOUNTING FRAMES**

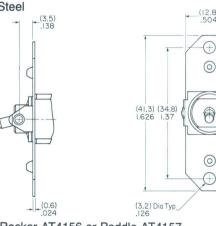
TN .272" Wide Flat Frame Stainless Steel



Used with Rockers AT4148, AT4150 and AT466 or Paddles AT4149, AT4151 and AT461

### TY .504" Wide Flat Frame

Stainless Steel



Used with Rocker AT4156 or Paddle AT4157

### **CONTACT MATERIALS & RATINGS**

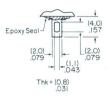
Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC



Gold over Brass or Copper Rated 0.4VA maximum @ 28V AC/DC maximum

## **TERMINALS**

Solder Lug

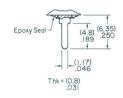


.062" Wide Quick Connect



Corresponds to AMP #60900-1 receptacle

03 .250" Straight PC

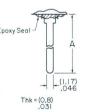


### Wirewrap

.425" (10.8mm)

.750" (19.05mm)

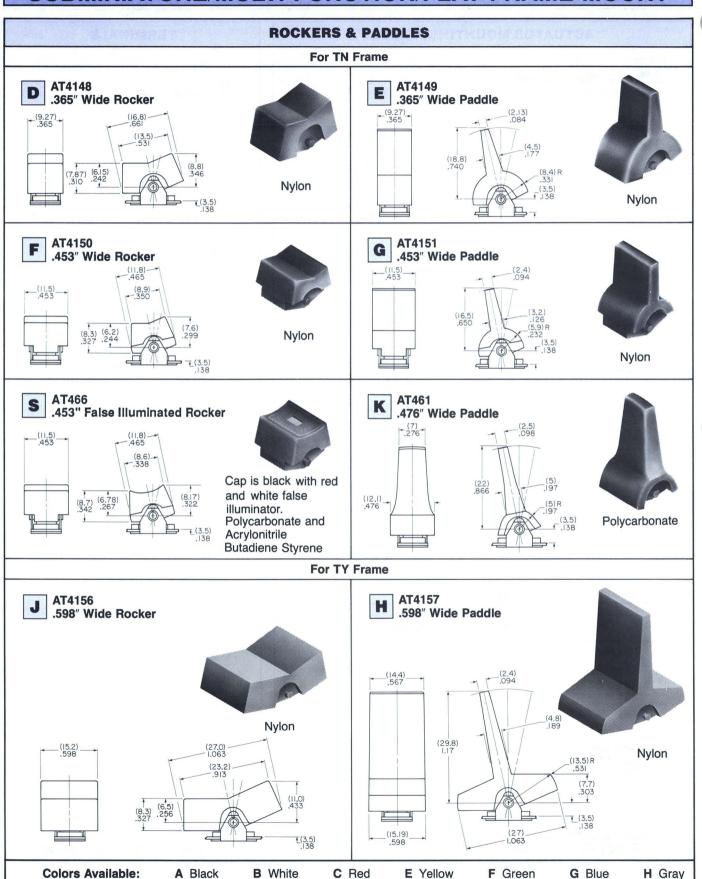
.964" 07 (24.5mm)



1.062" 08 (27.0mm)

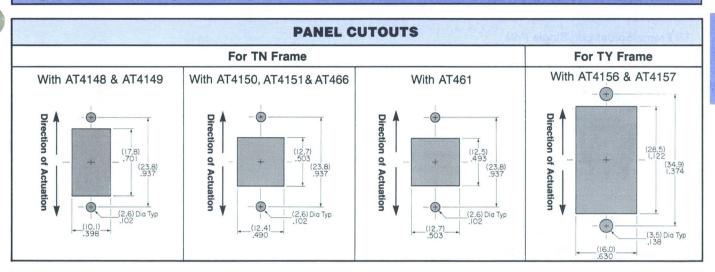
Dimension A = wirewrap terminal lengths as shown beside code boxes.

# SUBMINIATURE/MULTI-FUNCTION/FLAT FRAME MOUNT



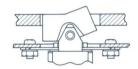


# SUBMINIATURE/MULTI-FUNCTION/FLAT FRAME MOUNT

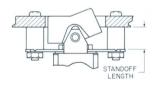


## **PANEL MOUNTING**

These devices are especially designed for subpanel mounting. When installed on a mounting plate behind the panel, hardware is completely concealed and the front panel retains a clean, attractive appearance. Mounting hardware is not provided. Optional panel mounting frames are available and are shown in the bracketed PC mounting section.



Flat frame devices may also be mounted to the face panel. Standoffs are used to recess the actuator and achieve an attractive front panel appearance. Optional hardware kits may be ordered from the table given below.



HARDWARE KITS			
Frame	Panel Thickness	Standoff Length	Hardware Kit Number
TN Frame	.125"	.233"	HK-1
TY Frame	.125"	.312"	HK-2

Hardware kits include: 2 each stainless steel screws, nuts and lockwashers and 2 aluminum or nylon standoffs.

## **SOLDERING LIMITS & WIRING SPECS**

## Soldering:

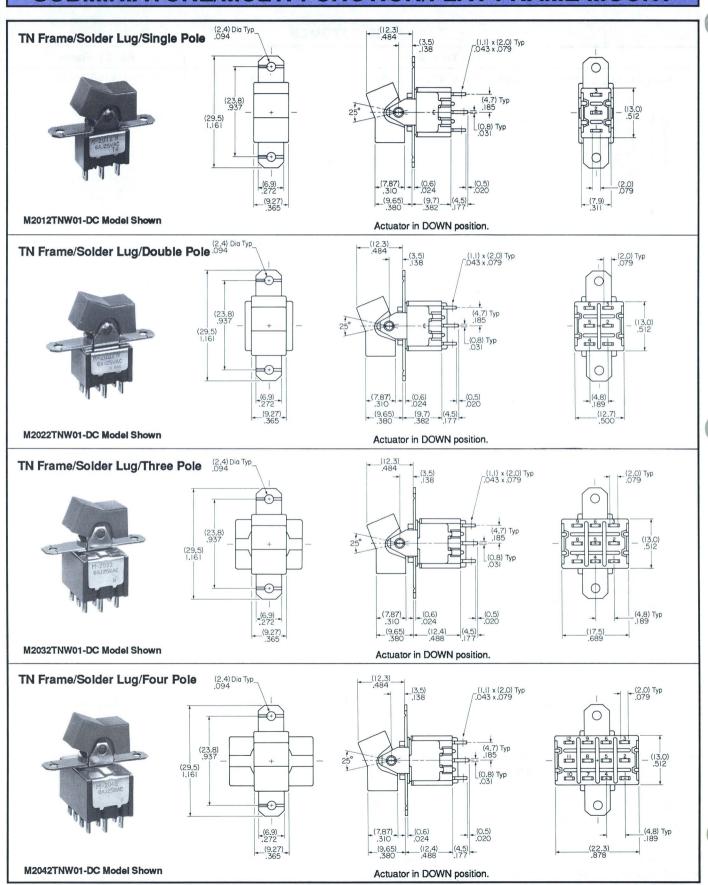
3 seconds at 350°C

5 seconds at 270°C

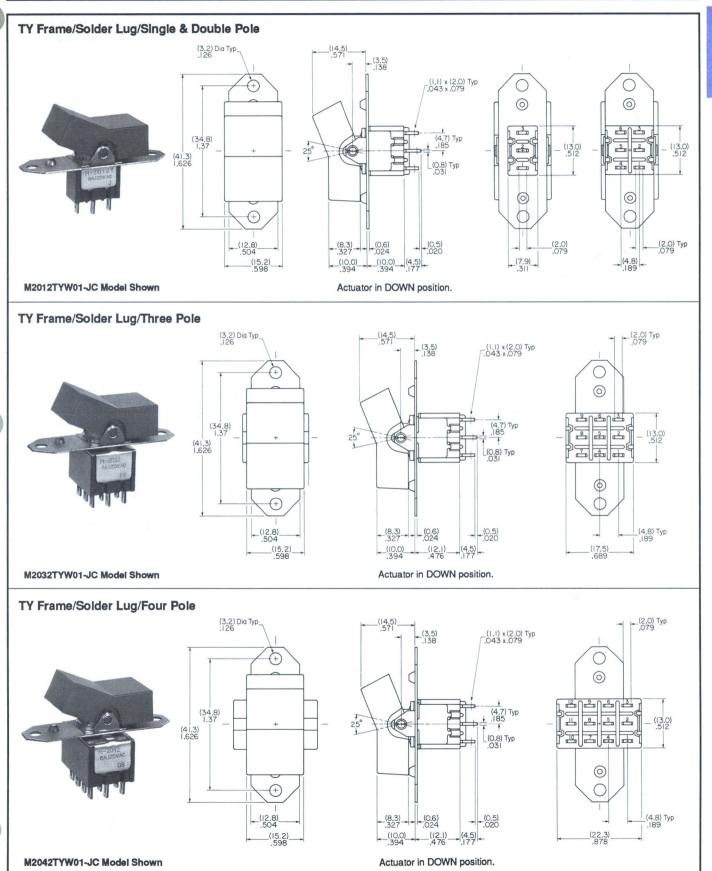
## Wiring:

Solder lug terminals have a .043" X .079" oblong hole which accommodates 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

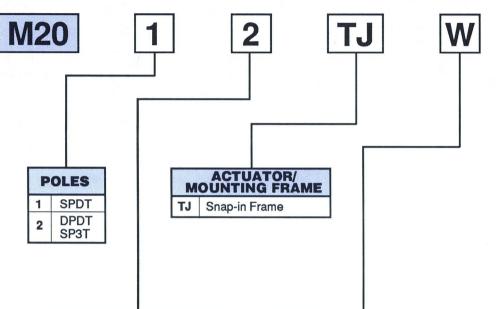
Single Pole	Double Pole
- (4.7) Typ - (4.7) Typ - (1.8) Dia Typ .073	(4.8) 3 6 (4.7) Typ 3 (1.85) Dia Typ (1.8) Dia Typ
Three Pole	Four Pole
-3 -6 -9 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	



# SUBMINIATURE/MULTI-FUNCTION/FLAT FRAME MOUNT



# **TYPICAL SNAP-IN FRAME**



CIRCUITS				
2	ON	NONE	ON	
3	ON	OFF	ON	
5	ON	NONE	(ON)	
8	(ON)	OFF	(ON)	
9	ON	OFF	(ON)	
4*	ON	ON	ON	
6*	(ON)	ON	(ON)	
7*	ON	ON	(ON)	
	( ) =	= Momen	tary	
* 3-	ON circu	its availal	ole with	

double pole base only.

CC	CONTACT MATERIALS & RATINGS				
W	Silver Rated 6A @ 125V AC & 3A @ 250V AC				
A	Gold over Silver Rated 6A @ 125V AC & 0.4VA max @ 28V AC/DC max				
G	Gold Rated 0.4VA max @ 28V AC/DC max				

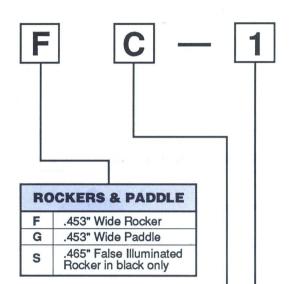
	TERMINALS
01	Solder Lug
02	Quick Connect
03	.250" Straight PC
05	.425" Wirewrap
06	.750" Wirewrap
07	.964" Wirewrap
08	1.062" Wirewrap

## **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (M2012TJW01-FC-1A):**

### **SERIES M ROCKER**



# **SWITCH ORDERING EXAMPLE**



RC	ROCKER & PADDLE COLORS				
A	Black				
В	White				
C	Red				
E	Yellow				
F	Green				
G	Blue				
Н	Gray				

A	

BEZEL COLORS		
A	Black	
В	White	
C	Red	
E	Yellow	
F	Green	
G	Blue	
Н	Gray	
	els with LEDs ilable in black	

only (code A)

LED COLORS		
С	Red	
F	Green	
CF	Red/Green	
CE	Red/Yellow	
CC	Red/Red	
FE	Green/Yellow	
FF	Green/Green	
EE	Yellow/Yellow	

# **OPTIONAL BEZELS**

- 1 Bezel without LED 2 Bezel with Single LED 3 Bezel with 2 Round LEDs
  - Bezel with 2 Rectangular LEDs

**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

# IINIATURE/MULTI-FUNCTION/SNAP-IN MOUNT

### **POLES & CIRCUITS**

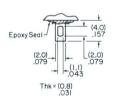
For poles and circuit information, refer to the details contained in the Poles & Circuits Chart appearing in the previous flat frame section.

## **CONTACT MATERIALS & RATINGS**

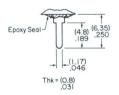
- Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC
- Gold over Silver Rated 6A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum
- Gold over Brass or Copper Rated 0.4VA maximum @ 28V AC/DC maximum

## **TERMINALS**

01 Solder Lug



.250" Straight PC



.062" Wide 02 **Quick Connect** 



Corresponds to AMP #60900-1 receptacle

### Wirewrap

.425" 05 (10.8mm)Epoxy Seal-.750" 06 (19.05mm) .964"

(24.5mm)

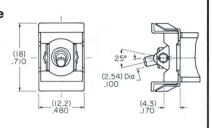
1.062" 08 (27.0mm)

> Dim. A represents above terminal lengths

## **ACTUATOR/MOUNTING FRAME**

TJ **Snap-in Frame** 

Stainless Steel



### **ROCKERS & PADDLE**

AT4150 .453" Wide Rocker

Nylon



AT4151 .453" Wide Paddle

Nylon



S .465" False Illuminated Rocker

> Polycarbonate and Acrylonitrile Butadiene Styrene

Black rocker with white & red false illuminator

Single Pole



**Double Pole** 

Dimension drawings of rockers and paddle appear in the previous flat frame section.

Colors Available: A Black **B** White E Yellow F Green G Blue H Gray

# PC BOARD MOUNTING

(1.8) Dia Typ .073

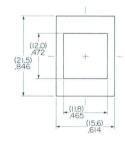
## **BEZELS AND LEDS**

AT207 1 **Bezel without LED** 

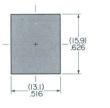
Polycarbonate

Colors: ABCEFGH









Direction of Actuation

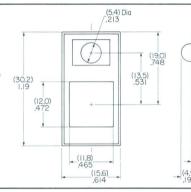
**AT208** 2 Bezel with AT070 LED

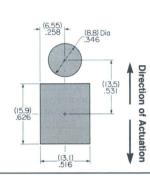
Polycarbonate

Bezel Color: A

LED Color: C. F







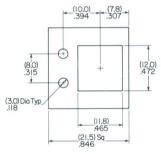
3 Bezel with AT617 LED

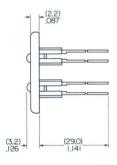
Polycarbonate

Bezel Color: A

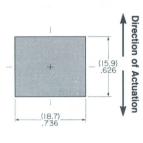
LED Color Combinations: CF CE CC FE FF EE







(2.2)



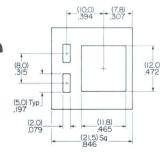
AT213 4 Bezel with AT618 LED

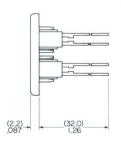
Polycarbonate

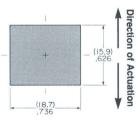
Bezel Color: A

**LED Color** Combinations: CF CE CC FE FF EE









BEZEL COLOR CODES	LED COLOR CODES		
A Black B White C Red E Yellow F Green G Blue H Gray Standard finish is shiny. Contact the factory for matte finish.	C Red CC Red/Red F Green FE Green/Yellow CF Red/Green FF Green/Green CE Red/Yellow EE Yellow/Yellow		

# SUBMINIATURE/MULTI-FUNCTION/SNAP-IN MOUNT

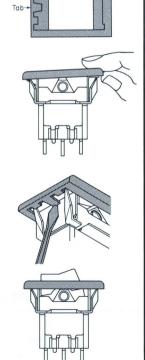
LED SPECIFICATIONS										
	AT070				AT617			AT618		
Lamp Color:		Red	Green	Red	Yellow	Green	Red	Yellow	Green	
Forward Peak Current	I <sub>FM</sub>	25mA	30mA	30mA	20mA	30mA	10mA	20mA	30mA	
Continuous Forward current	I <sub>F</sub>	20mA	20mA	24mA	16mA	24mA	8mA	16mA	24mA	
Forward Voltage	V <sub>F</sub>	2.8V	2.2V	2.01V	1.96V	1.95V	1.9V	1.9V	2.0V	
Reverse Peak Voltage	V <sub>RM</sub>	4V	4V	5V	4V	5V	5V	4V	5V	
Current Reduction Rate Above 25°C	$\Delta l_{_{\rm F}}$	0.33 mA/°C	0.40 mA/°C	0.40 mA/°C	0.27 mA/°C	0.40 mA/°C	0.13 0mA/°C	0.27 mA/°C	0.40 mA/°C	
Ambient Temperature Range (in bezel)		-10°C -	- +70°C	-1	15°C ~ +70°	С	-1	5°C ~ +70	°C	

Electrical specifications are determined at a basic temperature of 25°C. Lamp circuit is independent of switch operation Dimension drawings of lamps are in the Accessories at the end of this catalog. If the source voltage exceeds the LED's rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula at the end of the catalog.

### **BEZEL ASSEMBLY**

Bezel and switch are easily assembled as follows:

- 1. Pry out tab on bezel to a 45° angle.
- 2. Insert switch frame under tab and snap on bezel.
- 3. Push tab back into place.
- 4. Snap assembled bezel and switch into panel.



## **EFFECTIVE PANEL THICKNESS & PANEL CUTOUTS**

	Single Pole	Double Pole
Panel Cutouts without Bezel	- + - (15.9) 626 626 492	- (15.9) - (15.9) - (26) - (13.1) - (13.1)
Panel Thickness without Bezel		~ 3.2mm ~ .126")
Panel Thickness with Bezel		~ 2.5mm ~ .098")

### **SOLDERING LIMITS & WIRING SPECS**

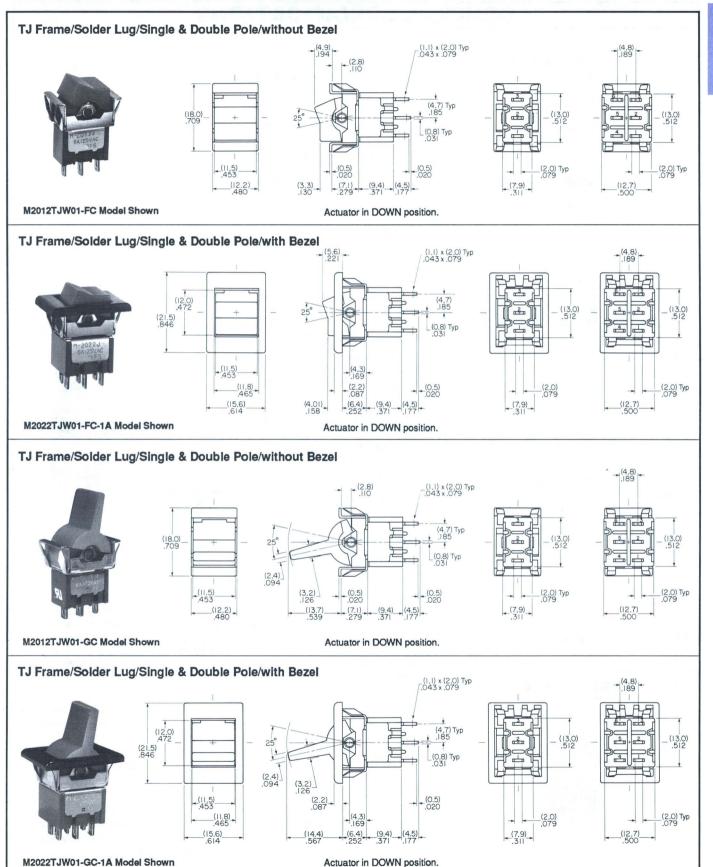
### Soldering:

3 seconds at 350°C 5 seconds at 270°C

## Wiring:

Solder lug terminals have a .043" X .079" oblong hole which accommodates 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

# SUBMINIATURE/MULTI-FUNCTION/SNAP-IN MOUNT



# MINIATURE/HEAVY DUTY/SNAP-IN MOUNT

# **GENERAL SPECIFICATIONS**

Electrical Capacity: 5A @ 125V AC

(Resistive Load) 6A @ 125V AC for ON-NONE-ON models

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 200 megohms minimum @ 500V DC

Dielectric Strength: 1,000V AC minimum

Mechanical Life: 30,000 operations minimum

Electrical Life: 10,000 operations minimum

Ambient Temp Range: -10°C through +70°C (+14°F through +158°F)

Angle of Throw: 26°

MATERIALS & FINISHES				
Frame	Stainless Steel			
Dust Cover	Fiberglass reinforced polyamide			
Base	Phenolic resin			
Movable Contactor	Phosphor bronze with silver plating or copper with silver plating			
Movable Contacts	Silver alloy			
Stationary Contacts	Silver alloy			
Terminals	Copper with silver plating			

## **ACTUAL SIZE**



### **APPLICATIONS**

Snap-in rockers and paddles have the same durable, rugged construction found in the other S series devices with the convenience of snap-in mounting. The stainless steel frame resists corrosion and provides for secure mounting over a wide range of panel thicknesses. This device carries a healthy 5 amp rating yet has a compact case with a behind panel depth of less than .850". Typical applications for these miniature rockers are found in test, aircraft and medical instruments; as well as, industrial machines and equipment.





Series PW rockers are available in single or double pole models with a variety of momentary or maintained circuit options. Securely staked solder lug terminals eliminate the need for epoxy seal, and a longer center solder lug terminal makes wiring easier. Users may select from two styles of paddles or a rocker in seven colors. To enhance front panel appearance, an optional bezel is offered or bezels with LED illumination are available.

## UL & CSA

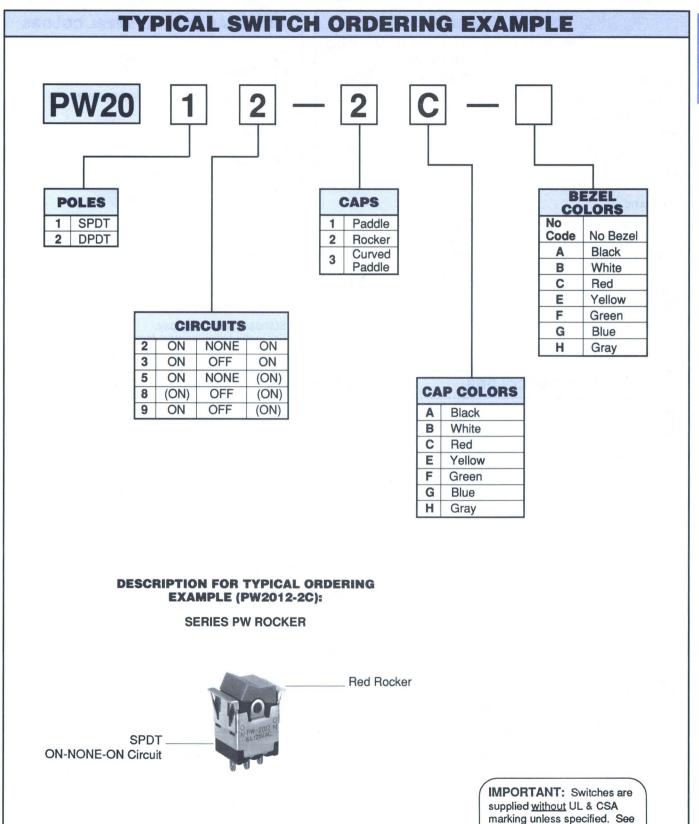
All models are recognized by Underwriters Laboratories Inc. for 5A @ 125V AC or 6A @ 125V AC for ON-NONE-ON models.

UL File No. E44145

All single pole models and some double pole models are certified by Canadian Standards Association: single pole models & PW2025 & PW2029 for 5A @ 125V AC & PW2022 for 6A @ 125V AC.

CSA File Nos. LR23535 and LR56017.

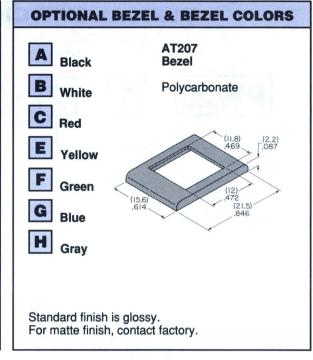
# RIES PW ROCKER SWITCHES



Supplement for instructions.

# MINIATURE/HEAVY DUTY/SNAP-IN MOUNT

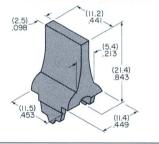
		POLES & C		
		ROCKER POS	SITION & TERMI	
			( ) = Momentary	
POLE &		Down	Center	Up
THROW	MODEL			
	PW2012	ON	NONE	ON
	PW2013	ON	OFF	ON
SPDT	PW2015	ON	NONE	(ON)
	PW2018	(ON)	OFF	(ON)
	PW2019	ON	OFF	(ON)
CONNECTED TERMINALS		2-3	OPEN	2-1
SCHEMAT	ГІС		2 (COMM)	
	PW2022	ON	NONE	ON
	PW2023	ON	OFF	ON
DPDT	PW2025	ON	NONE	(ON)
	PW2028	(ON)	OFF	(ON)
	PW2029	ON	OFF	(ON)
CONNECT TERMINA		2-3 5-6	OPEN	2-1 5-4
SCHEMAT	ГІС	10	92 (COMM) 59 93 40 6	-



## **CAP & CAP COLORS**

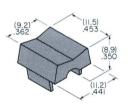


Polycarbonate



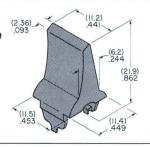
AT437 Rocker

Polycarbonate



3 AT458 Curved Paddle

Polycarbonate



Colors Available:

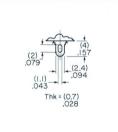
A Black B White C Red

E Yellow F Green G Blue H Gray

Standard finish is glossy.

For matte finish, contact factory.

## **TERMINALS**



### **SOLDERING & WIRING**

Soldering Limits:

3 seconds @ 350°C

5 seconds @ 270°C

Wiring:

Solder lug terminals have .043" X .079" oblong holes which accommodate 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

PANEL CUTOUT & PANEL THICKNESS			
PANEL CUTOUT PANEL THICKNESS			
Single & Double Pole  - (15,0) - (15,0)	Without Bezel:	1mm ~ 3.2mm (.039" ~ .126")	
.591	With Bezel:	1mm ~ 2.5mm (.039" ~ .098")	

## **OPTIONAL BEZELS WITH LEDS**

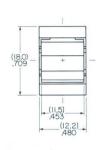
Several bezels with LEDs, AT208, AT212 and AT213 are available for use with PW rockers. Dimension drawings, panel cutouts, LED color codes and LED lamp specifications appear in Series E Snap-in Pushbutton Section (EB). Bezel assembly instructions may be found in Series M Snap-in Rocker Section. When ordering, specify both the bezel AT number and the LED color code.

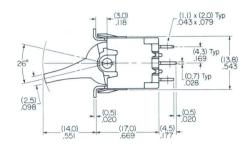
# **SERIES PW ROCKER SWITCHES**

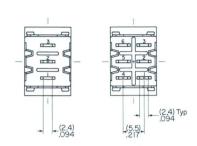
# MINIATURE/HEAVY DUTY/SNAP-IN MOUNT

## Paddle without Bezel/Solder Lug/1 & 2 Pole





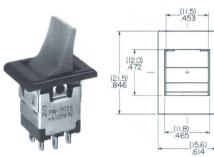


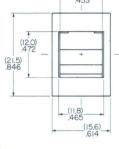


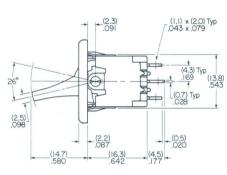
PW2012-1C Model Shown

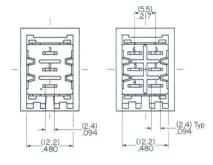
Actuator in DOWN position.

### Paddle with Bezel/Solder Lug/1 & 2 Pole









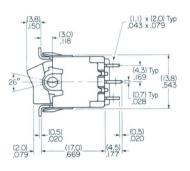
PW2022-1C-A Model Shown

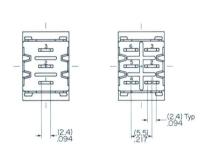
Actuator in DOWN position.

## Rocker without Bezel/Solder Lug/1 & 2 Pole







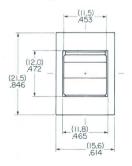


PW2022-2C Model Shown

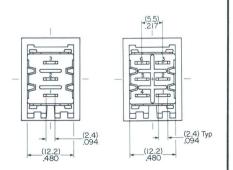
Actuator in DOWN position.

## Rocker with Bezel/Solder Lug/1 & 2 Pole





(1.1) x (2.0) Typ .043 x .079

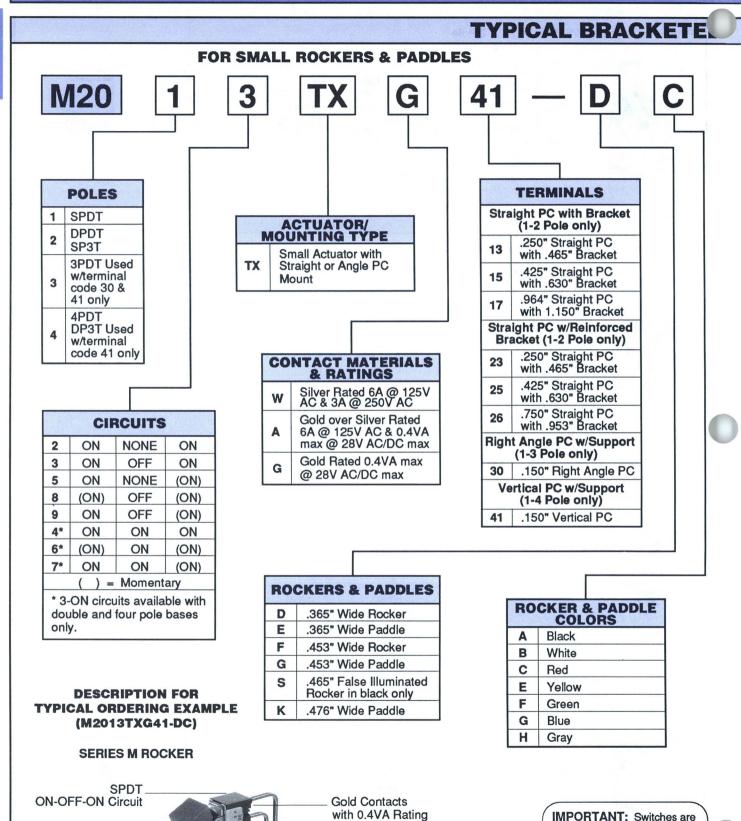


PW2012-2C-A Model Shown

Actuator in DOWN position.



# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT



Red .365"

Wide Rocker

.150" Vertical PC Terminals

with Support

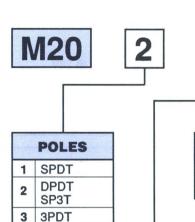
supplied without UL & CSA

Supplement for instructions.

marking unless specified. See

# SWITCH ORDERING EXAMPLES

## **FOR LARGE ROCKER & PADDLE**



4PDT

DP3T

3 pole & 4 pole

terminal code 24

used with

only

ACTUATOR/ MOUNTING TYPE

Large Actuator with TZ Straight PC Mount

# CONTACT MATERIALS & RATINGS

w	Silver Rated 6A @ 125V AC & 3A @ 250V AC
A	Gold over Silver Rated 6A @ 125V AC & 0.4VA max @ 28V AC/DC max

Gold Rated 0.4VA max @ 28V AC/DC max

	TE	RM	IINA	LS
Stra	ight	PC	with	Bracket

.250" Straight PC with .465" Bracket 13 .425" Straight PC with .630" Bracket 15 .964" Straight PC

17 with 1.150" Bracket Straight PC with

**Reinforced Bracket** .250" Straight PC with .465" Bracket

.250" Straight PC 24 with .548" Extended **Bracket** 

.425" Straight PC 25 with .630" Bracket .750" Straight PC with .953" Bracket 26

2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)
4*	ON	ON	ON
6*	(ON)	ON	(ON)
7*	ON	ON	(ON)

**CIRCUITS** 

) = Momentary

\* 3-ON circuits available with double and four pole bases only.

## **ROCKER & PADDLE**

J	.598" Wide Rocker	•
Н	.598" Wide Paddle	

# **ROCKER & PADDLE**

COLORS		
A	Black	
В	White	
С	Red	
E	Yellow	
F	Green	
G	Blue	
Н	Gray	

**DESCRIPTION FOR TYPICAL ORDERING EXAMPLE** (M2022TZG23-JC)

**SERIES M ROCKER** 



Gold Contacts with 0.4VA Rating

.250" Straight PC Terminals with Reinforced Bracket

DPDT

# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT

### **POLES & CIRCUITS**

For poles and circuit information, refer to the details contained in the Poles & Circuits Chart appearing in the previous flat frame section.

### **ACTUATOR/MOUNTING TYPES**

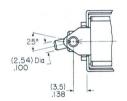
TX

Small Actuator with Straight or Angle PC Mount

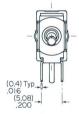
The TX code describes a device which accepts a small actuator and mounts to a PC board with a bracket or support depending upon terminal selected. Note: Not for use with terminal code 24.

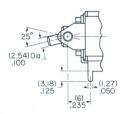
## Straight PC Mounting





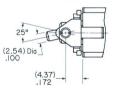
### **Vertical PC Mounting**





## **Right Angle PC Mounting**

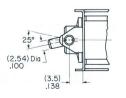




### TZ Large Actuator with Straight PC Mount

The TZ code describes a device which accepts a large actuator and mounts to a PC board with a bracket. Note: Not for use with terminal code 30 & 41.





## **CONTACT MATERIALS & RATINGS**

Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC

Gold over Silver Rated 6A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum

G

Gold over Brass or Copper Rated 0.4VA maximum @ 28V AC/DC maximum

## **TERMINALS**

For TX and TZ Straight PC Mount with Bracket (1-2 pole)

13

.250" Straight PC with .465" Bracket

15

425"Straight PC with .630" Bracket

17

.964"Straight PC with

1.150" Bracket

Straight PC Mount with Reinforced Bracket (1-2 pole)

23

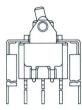
.250"Straight PC with .465" Bracket

25

.425"Straight PC with .630" Bracket

26

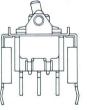
.750"Straight PC with .953" Bracket



For TZ Straight PC Mount with Extended Bracket (1-4 pole)

24

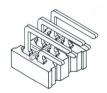
.250"Straight PC with .548" Extended Bracket



For TX Right Angle PC Mount (1-3 pole)

30

.150"Right Angle PC



Vertical PC Mount (1-4 pole)

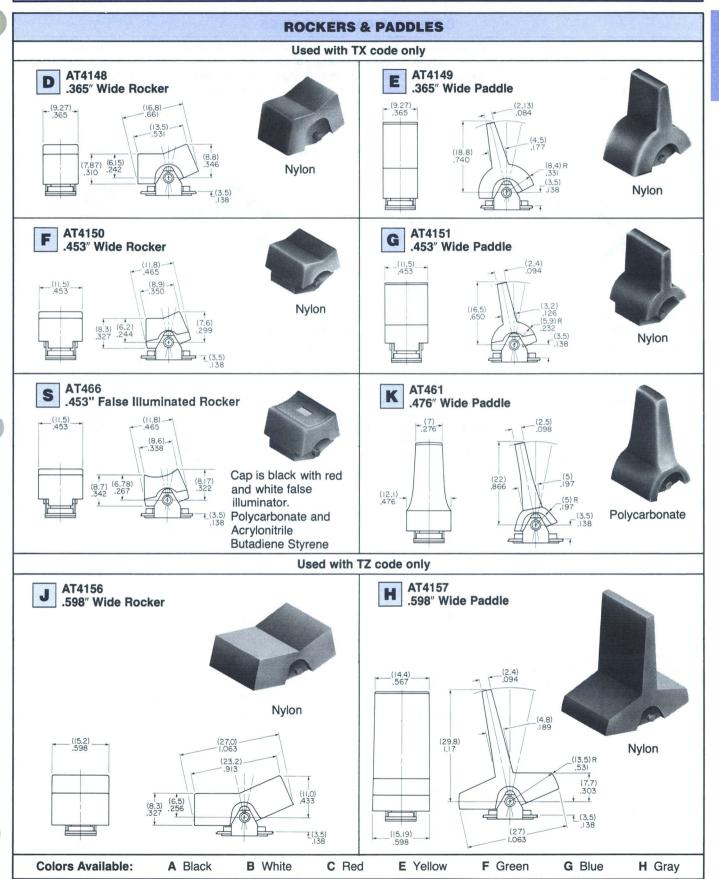
41

.150"Vertical PC



Full dimensioned drawings appear at the end of this rocker section.

# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT



# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT

### **OPTIONAL PANEL FRAMES**

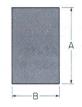
Shiny black polyamide panel frames are available for small rockers and paddles. Two sizes of frames are available to accommodate different size actuators. Each frame adapts to the range of panel thicknesses and panel cutout tolerances given in the table. Frames snap directly into panel openings and mount separately from switches. Switches must be aligned with the panel cutout to allow for the proper clearance between the actuator and panel frame.

**Panel Frame** 

AT0642 **Panel Frame** 

Used with Rocker AT4148 or Paddle AT4149





AT0651 **Panel Frame**  **Panel Frame** 

Used with Rockers AT4150 and AT466 or Paddle AT4151





Part Number	Panel Thickness	Dim. A	Dim. B	Part Number	Panel Thickness	Dim. A	Dim. B
AT0641	1.2 ~ 2.3mm			AT0651	1.2mm (.047")	15.11 ~ 15.37mm	
	(.047 ~ .090")	20.24 ~ 20.4mm	12.57 ~ 12.83mm	AT0652	1.57mm (.062")	(.595 ~ .605")	12.57 ~ 12.7mm
AT0642	1.57 ~ 3.18mm	(.797 ~ .803")	(.495 ~ .505")	AT0651		15.75 ~ 15.88mm	(.495 ~.500")
	(.062 ~ .125")		,	AT0652	3.18mm (.125")	(.620 ~ .625")	

PANEL CUTOUTS			
	For Small Actuators		For Large Actuators
Used with AT4148 & AT4149	Used with AT4150, AT4151 & AT466	Used with AT461	Used with AT4156 & AT4157
Direction of Actuation	Direction of Actuation  - (12.7) - (12.4) - (12.	Direction of Actuation	- (28.5) - (28.5) 1.122 - (16.0) 630

# SOLDERING

Soldering Time & Temperature Limits:

- 3 seconds @ 350°C
- 5 seconds @ 270°C

### STRAIGHT PCB MOUNTING WITH EXTENDED BRACKET

# **Three Pole Four Pole** Single Pole **Double Pole** (1.8) Dia Typ. .073 (1.8) Dia Typ .073 (1.5) Dia Typ 059

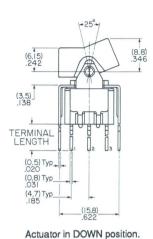
# SUBMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT

## Small Rocker/Straight PC with Bracket/Single & Double Pole

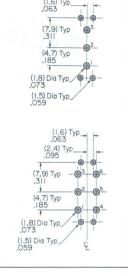


M2012TXG13-DC Model Shown

Terminal	Bracket
Length	Length
.250"	.465"
(6.4mm)	(11.8mm)
.425"	.630"
(10.8mm)	(16.0mm)
.964"	1.150"
(24.5mm)	(29.2mm)
	Length .250" (6.4mm) .425" (10.8mm) .964"



(1.17) Typ
.0.46

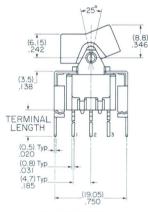


Small Rocker/Straight PC with Reinforced Bracket/Single & Double Pole

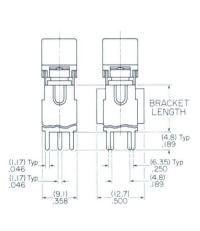


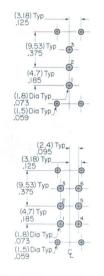
M2012TXG23-DC Model Shown

Terminal Code	Terminal Length	Bracket Length
23	.250" (6.4mm)	.465" (11.8mm)
25	.425" (10.8mm)	.630" (16.0mm)
26	.750" (19.05mm)	.953" (24.2mm)



Actuator in DOWN position.



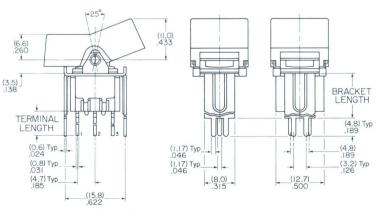


## Large Rocker/Straight PC with Bracket/Single & Double Pole

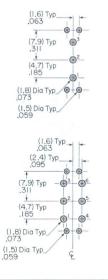


M2012TZG13-JC Model Shown

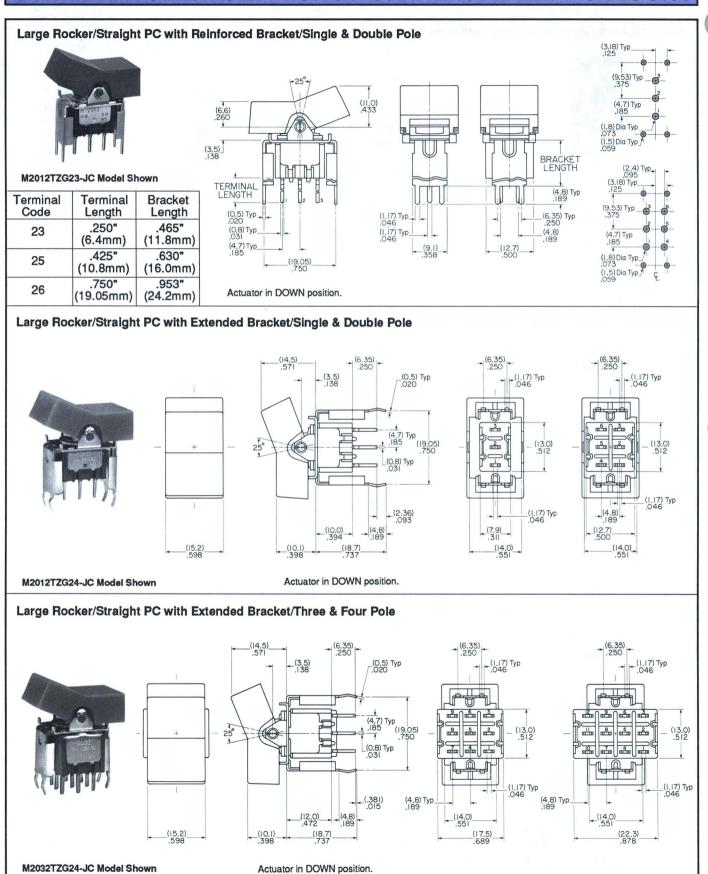
Terminal Code	Terminal Length	Bracket Length
13	.250" (6.4mm)	.465" (11.8mm)
15	.425" (10.8mm)	.630" (16.0mm)
17	.964" (24.5mm)	1.150" (29.2mm)



Actuator in DOWN position.



# BMINIATURE/MULTI-FUNCTION/BRACKETED PC MOUNT

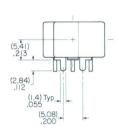


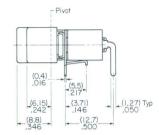
# **NKK** SERIES M ROCKER SWITCHES

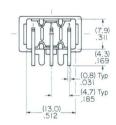
## JRE/MULTI-FUNCTION/BRACKETED PC

Small Rocker/.150" Right Angle PC/Single Pole









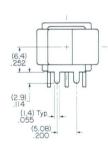


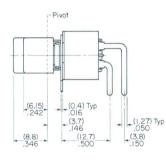
M2012TXG30-DC Model Shown

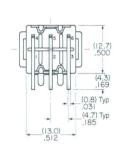
Actuator in DOWN position.

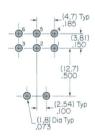
Small Rocker/.150" Right Angle PC/Double Pole









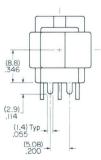


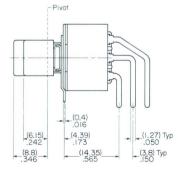
M2022TXG30-DC Model Shown

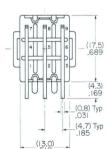
Actuator in DOWN position.

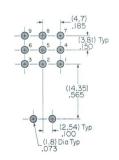
Small Rocker/.150" Right Angle PC/Three Pole









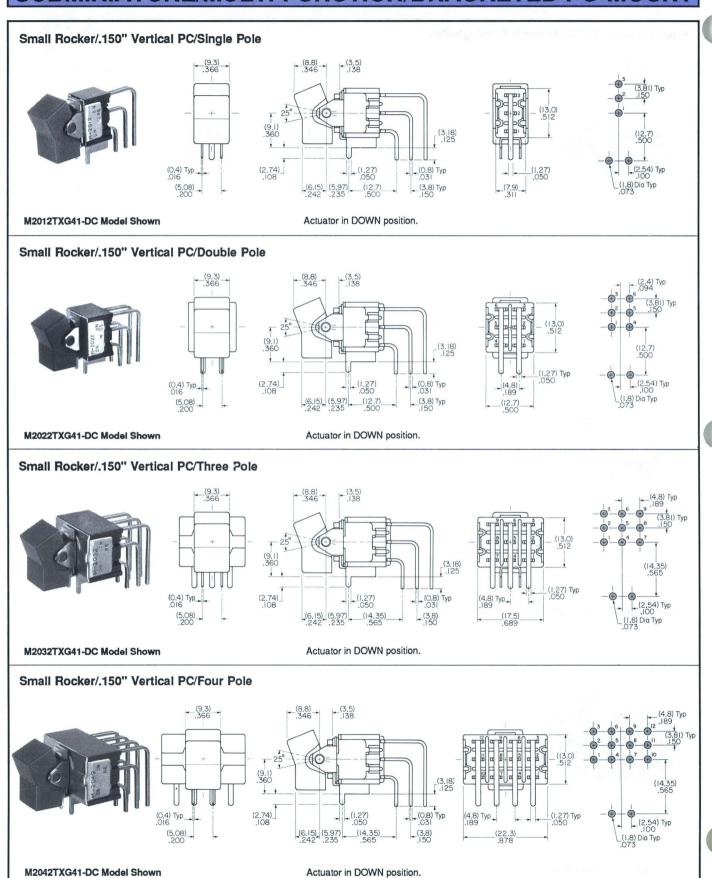


M2032TXG30-DC Model Shown

Actuator in DOWN position.

# **NKK** SERIES M ROCKER SWITCHES

### IRE/MULTI-FUNCTION/BRACKETED PC MOUNT



### SUBMINIATURE/MOMENTARY & ALERNATE/1-4 POLE

#### **M SERIES PUSHBUTTONS - MB2000**

These pushbutton switches are available in single, double and four pole models with either momentary or alternate action circuits. A large number of options make MB2000 switches extremely versatile. Screw-on or snap-on caps in seven colors; 1/4", 6mm, or large 12mm diameter threaded bushings, and a .244" smooth bushing; ratings of 6A or 0.4VA plus a dual rating; and numerous terminal options make these switches suitable for a variety of applications. This series offers many accessories such as: splashproof boots, mounters, colored shrouds and conical nuts which enhance front panel appearance.

MB2000 is divided into sections by mounting types: Bushing Mount, Bracketed & Angle PC Mount and Large Bushing Mount. In the beginning of each of these sections, a Typical Ordering Example outlines the different options available for each mounting type. Detail pages following each ordering example provide additional information regarding the options outlined and accessories available.











Bracketed & Angle PC Mount Pages M58 - M63





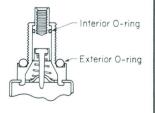
#### CONTACT MECHANISM

The MB2000 is a slow make, slow break device which employs an over center actuator block. This design feature diminishes sparking and increases operating life in AC circuits. A guide interlocked with the actuator block prevents window locking and maintains correct plunger alignment to assure contact stability.



#### **SPLASHPROOF OPTION**

A splashproof feature is incorporated into the .335" long threaded bushing. An o-ring within the bushing itself and one under the face nut protect the switch from splashed, sprayed or spilled water and other liquids. MB2000 devices ordered with the D3 bushing code provide this splashproof characteristic.



Jwitches

### SUBMINIATURE/MOMENTARY & ALERNATE/1-4 POLE

#### **GENERAL SPECIFICATIONS**

Electrical Capacity: 6A @ 125V AC or 3A @ 250V AC

(Resistive Load) 6A @ 30V DC

0.4VA maximum @ 28V maximum AC/DC

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance: 10 milliohms maximum for silver

20 milliohms maximum for gold

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 1,000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life: 100,000 operations minimum

50,000 operations minimum for splashproof devices

Electrical Life: 25,000 operations minimum for silver

50,000 operations minimum for gold

Nominal Operating Force: Momentary Alternate Action

Single Pole 950 grams 450 grams
Double Pole 1,650 grams 720 grams
Four Pole 2,400 grams 1,200 grams

Ambient Temp Range: -15°C through +85°C (+5°F through +185°F)

Optional low temperature lubricant available

V	IATERIALS & FINISHES	
Plunger	Brass w/nickel plating; polyacetal resin (B1 bushing)	
Bushing	Brass with nickel plating	
Frame	Stainless steel	
Case	Diallyphthalate resin (UL 94V-0 flammability rating)	
Movable Contactor	Phosphor bronze with silver or gold plating*	
Movable Contacts	Silver alloy (code W); silver alloy with gold plating* over nickel (code A); or copper with gold plating* over nickel (code G)	
Stationary Contacts	Silver with silver plating (code W); silver with gold plating* over nickel (code A); or copper or brass with gold plating* over nickel (code G)	
Terminals	Copper or brass with silver plating; copper or brass with gold plating over nickel	
* Gold plating on co	ntacts is 1 micron minimum.	

#### UL & CSA

UL File No. E44145

All models with ratings of 6A @ 125V AC, 3A @ 250V AC, and 0.4VA @ 28V AC/DC are recognized by Underwriters Laboratories Inc.

CSA File Nos. LR 23535 and LR56017

Models rated 6A @ 125V AC, 3A @ 250V AC, and 0.4VA @ 28V AC/DC certified by Canadian Standards Association: 1-pole with PC, solder lug, and wirewrap; 2- and 4-pole with PC, solder lug, wirewrap, and quick connect.

	compad tobar PL	UNGER TRAVEL	
	With Screen	ew-on Cap Alternate Action	With Snap-on Caps Momentary & Alternate Action
Pretravel	0.71mm (.028")	2.80mm (.110")	3.19mm (.125")
Overtravel	1.09mm (.043")	1.10mm (.043")	1.26mm (.050")
Total Travel	1.80mm (.071")	3.90mm (.153")	4.45mm (.175")



### **MOMENTARY & ALTERNATE/1-4 POLE/BUSHING MOUNT**

### **TYPICAL BUSHING MOUNT SWITCH ORDERING EXAMPLE**



2011

S

**S1** 

W

01

C

C

PO	LES &	CIRCU	ITS
2011	SPDT	ON	(ON)
2065	SPDT	ON	ON
2061	DPDT	ON	(ON)
2085	DPDT	ON	ON
2181	4PDT	ON	(ON)
2185	4PDT	ON	ON

( ) = Momentary

# CONTACT MATERIALS & RATINGS Silver

W Rated 6A @ 125V AC & 3A @ 250V AC Gold over Silver

A Rated 6A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum

Gold
Rated 0.4VA maximum
@ 28V AC/DC maximum

#### CAPS

B .315" Dia.
C .394" Dia.

#### CAP COLORS

A Black
B White
C Red
E Yellow
F Green
G Blue
H Gray

#### **PLUNGER TYPES**

S Plunger for Screw-on Caps

Plunger for Snap-on Caps

#### BUSHINGS

S1	.335" Threaded with Keyway
S2	.335" Smooth with Keyway
S4	.335" Threaded 6mm with Keyway
D1	.335" Threaded with D Flat
Da	.335" Threaded Splashproof

without Keyway

	TERMINALS
01	Solder Lug
02	Quick Connect
03	.250" Straight PC
05	.425" Wirewrap
06	.750" Wirewrap
07	.964" Wirewrap

1.062" Wirewrap

# DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (MB2011SS1WC1-CC):

#### **SERIES M PUSHBUTTON**

**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

Red .394" Diameter Cap.

MB-2011 6A/23VAC

Plunger for Screw-on Caps .335" Threaded Bushing with Keyway

SPDT

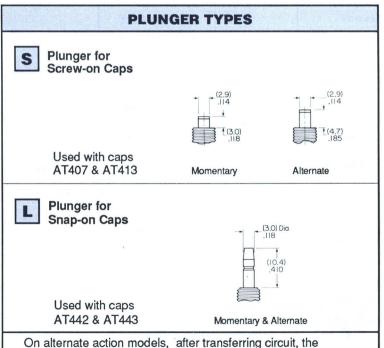
ON-(ON) Circuit

Silver Contacts with 6 Amp & 3 Amp Rating

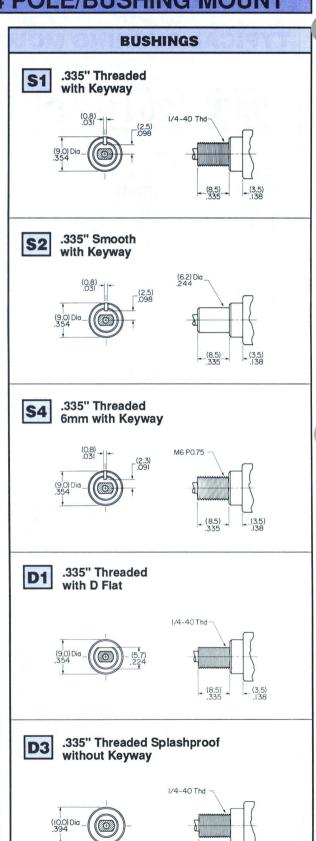
Solder Lug Terminals

### **MOMENTARY & ALTERNATE/1-4 POLE/BUSHING MOUNT**

		POLES	& CIRCUI	TS	
			R POSITION 8	& TERMINAL	NUMBERS
POLE & THROW	MODEL	Normal	Kayway	Down	l
SPDT	MB2011 MB2065		ON ON		ON) ON
CONNECT TERMINAL			2-3	2	2-1
SCHEMAT	IC		3.	2 (COMM)	
DPDT	MB2061 MB2085		ON ON		ON) ON
CONNECT		2-3	5-6	2-1	5-4
SCHEMA	TIC		3 • 2 (0	COMM) 5 • 6 • 4	
4PDT	MB2181 MB2185		ON ON		ON) ON
CONNECT		2-3 8-9	5-6 11-12	2-1 8-7	5-4 11-10
SCHEMAT	IC		3 -1 6 -4	OMM) 98 119 9 • 7 12 • 10	
Terminal n	umbers are no	ot actually on t	he switch.		



plunger returns to its original position and does not latch down.



# **DKK**®

# **SERIES M PUSHBUTTON SWITCHES**

## **MOMENTARY & ALTERNATE/1-4 POLE/BUSHING MOUNT**

#### **CONTACT MATERIALS & RATINGS**

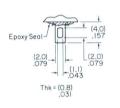
Silver over Silver
Rated 6A @ 125V AC &
3A @ 250V AC

Gold over Silver
Rated 6A @ 125V AC &
0.4VA maximum @ 28V AC/DC maximum

Gold over Brass or Copper Rated 0.4VA maximum @ 28V AC/DC maximum

#### **TERMINALS**

01 Solder Lug

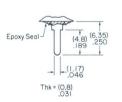


.062" Wide Quick Connect



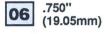
Corresponds to AMP #60900-1 receptacle

.250" Straight PC



#### Wirewrap

**05** .425" (10.8mm)







Dimension A = wirewrap terminal lengths as shown beside code boxes.

#### CAPS

B

.315" Diameter

AT413 Screw-on Cap



AT443 Snap-on Cap

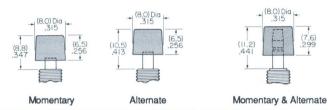
Polycarbonate



Polystyrene

For use with Plunger Code S

For use with Plunger Code L





.394" Diameter

AT407 Screw-on Cap

Polystyrene



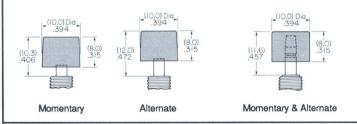
AT442 Snap-on Cap

Polycarbonate



For use with Plunger Code S

For use with Plunger Code L



#### Colors Available:

A Black B White C Red E Yellow F Green G Blue H Gray

PC BOARD MOUNTING			
Single Pole	Double Pole	Four Pole	
- (4.7) Typ - (4.7) Typ - (8.5) 14 - (1.8) Dia Typ .073			

#### STANDARD MOUNTING HARDWARE AT509 AT513H for Inch **AT516** AT513M for Metric O-ring for Splash-Lockwasher **Hex Nut** proof Bushing Brass, nickel plated Steel, chromate Nitrile butadiene over zinc plating rubber 1/4-40 Thd or M6 P0.75

Hardware included with each switch, except splashproof: Two AT513 (H or M) and one AT509. Splashproof models include: One AT513H and one AT516.

AT507H for Inch **AT507M for Metric** Locking Ring Steel, chromate over zinc plating (6.0) Dia or (12.0) Dia

**OPTIONAL HARDWARE** 

#### **OPTIONAL MOUNTING COLLARS**

AT512H for Inch AT512M for Metric **Conical Nut** 

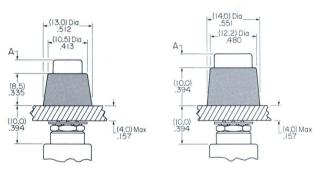
AT512CH for Inch AT512CM for Metric Conical Nut

Used with .315" Dia. Cap

Used with .394"Dia. Cap

Brass with chrome plating

Brass with chrome plating



Cap height (Dimension A):

2.3mm (.091") for momentary AT413 & AT407 4.0mm (.157") for alternate AT413 & AT407

3.6mm (.142") for momentary & alternate AT443 & AT442

#### **OPTIONAL SPLASHPROOF BOOTS**

AT4041H for Inch AT4041M for Metric **Boot for Momentary** 

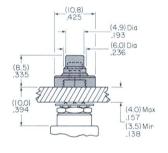
**Boot for Alternate** 

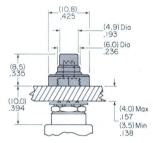
Silicone Rubber

Silicone Rubber

AT4042H for Inch

AT4042M for Metric





Operating Life 100,000

Operating Life: 30,000

Splashproof boots fit directly over the plunger for screw-on caps. Boots for momentary devices are accompanied by a threaded adaptor which extends the length of the plunger.

	Without	With	With	With
	Keyway	Keyway	D Flat	Locking Ring
Panel Cutouts	- (6.5) Dia - 256	(6.5) Dia .256 (5.6) .220 .024	- (5.8) 228 - (6.5) Dra .256	-(6.5) Did -256 -(6.5) -8-(2.2) Did -(8.2) Did

#### SOLDERING & WIRING

Soldering:

3 seconds @ 350°C 5 seconds @ 270°C

#### Wiring:

Solder lug terminals have .043" X .079" oblong holes which accommodate 1 solid 18-gauge wire or 2 solid or stranded 20gauge wires.

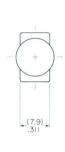
# UKK.

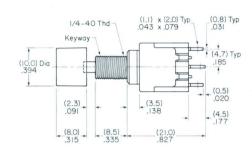
## **SERIES M PUSHBUTTON SWITCHES**

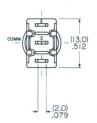
### **MOMENTARY & ALTERNATE/1-4 POLE/BUSHING MOUNT**

#### Solder Lug/Single Pole





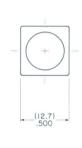


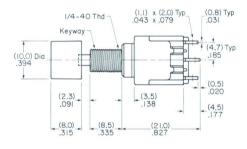


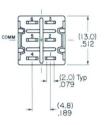
MB2011SS1WO1-CC Model Shown

#### Solder Lug/Double Pole





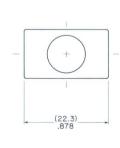


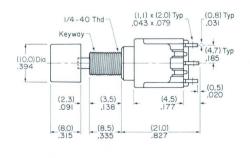


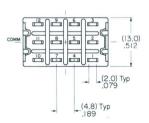
MB2061SS1WO1-CC Model Shown

#### Solder Lug/Four Pole





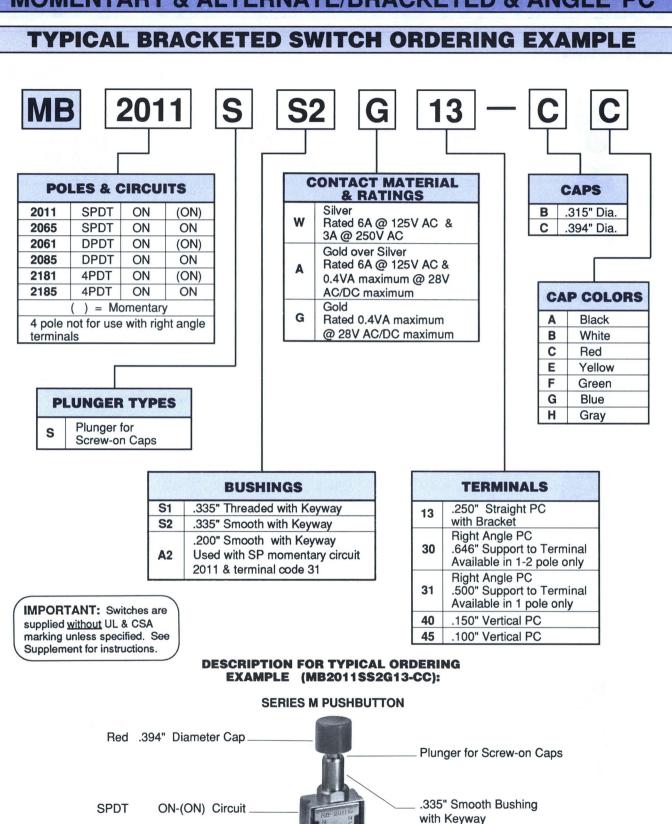




MB2181SS1W01-CC Model Shown



### MOMENTARY & ALTERNATE/BRACKETED & ANGLE



**DKK**®

Gold Contacts with 0.4VA Rating

.250" Straight PC Terminals

with Bracket

### **MOMENTARY & ALTERNATE/BRACKETED & ANGLE PC**

#### **POLES & CIRCUITS**

For poles and circuit information, refer to the details contained in the Poles & Circuits Chart appearing in the previous bushing mount section.

#### **PLUNGER TYPES**







Momentary

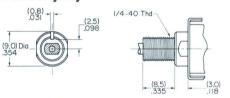
Alternate

Used with caps AT407 & AT413

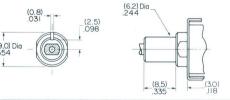
On alternate action models, after transferring circuit, the plunger returns to its original position and does not latch down.

#### **BUSHINGS**

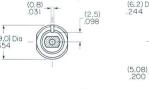
.335" Threaded with Keyway



S2 .335" Smooth with Keyway



.200" Smooth with Keyway





For use with circuit 2011 & terminal code 31

#### **CONTACT MATERIALS & RATINGS**

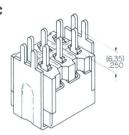
Silver over Silver
Rated 6A @ 125V AC &
3A @ 250V AC

Gold over Silver
Rated 6A @ 125V AC &
0.4VA maximum @ 28V AC/DC maximum

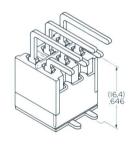
Gold over Brass or Copper Rated 0.4VA maximum @ 28V AC/DC maximum

#### **TERMINALS**

.250" Straight PC with Bracket

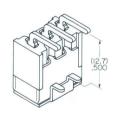


Right Angle PC with .646" Support to Terminal



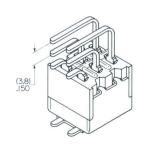


Right Angle PC with .500" Support to Terminal

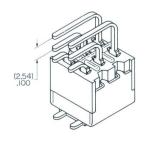


Available in 1 pole only

.150" Vertical PC



.100" Vertical PC



Full dimensioned drawings appear at the end of this pushbutton section.

nkk" **switches** • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

## CAPS



**AT413** .315" Diameter Screw-on Cap

Polystyrene



Cap and plunger dimension:





Momentary

Alternate



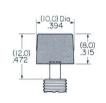
**AT407** .394" Diameter Screw-on Cap

Polystyrene



Cap and plunger dimension:





Momentary

Alternate

Colors Available:

Black G Blue

**B** White H Gray

C Red

E Yellow

F Green

#### HARDWARE

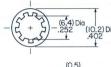
AT513H for Inch **Hex Nut** 

**AT509** Lockwasher

Brass, nickel plated



Steel, chromate over zinc plating





Two AT513H Hex Nuts and one AT509 Lockwasher are supplied with each switch ordered with a threaded bushing. The optional locking ring, AT507, appears in the hardware section at the end of this catalog.

#### SOLDERING

Soldering time and temperature limits:

3 seconds at 350°C

5 seconds at 270°C

#### **PANEL CUTOUTS & PANEL THICKNESS**

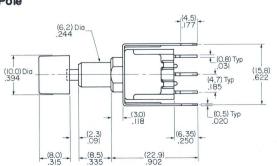
2	Without	With	With
	Keyway	Keyway	Locking Ring
	-(6.5) Dia	(6.5) Dia -256 -(5.6) -220 -1-(0.6) -024	-(6,5) Dia -256 -(6,5) -256 -(2,2) Dia .087

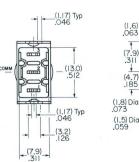
**Maximum Effective Panel Thickness** with Standard Hardware:

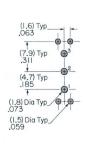
3.9mm (.154")

# Straight PC with Bracket/Single Pole

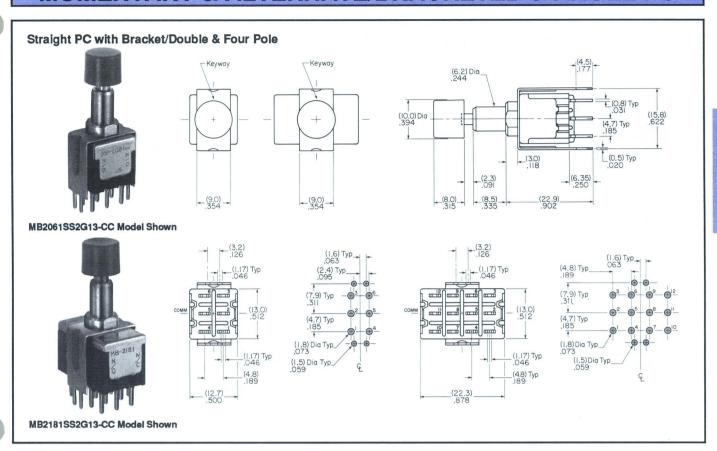


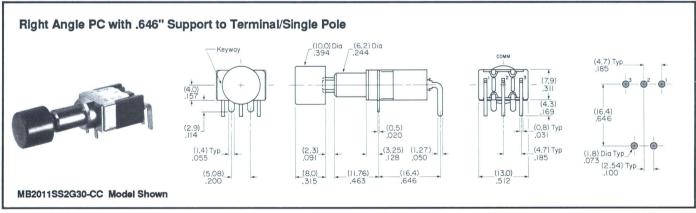


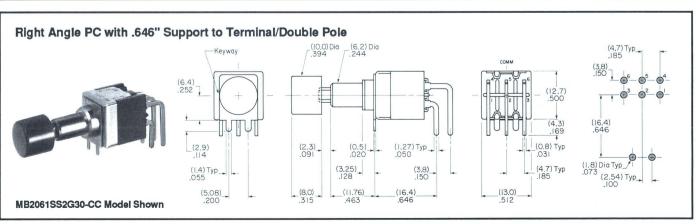




#### MOMENTARY & ALTERNATE/BRACKETED & ANGLE PC

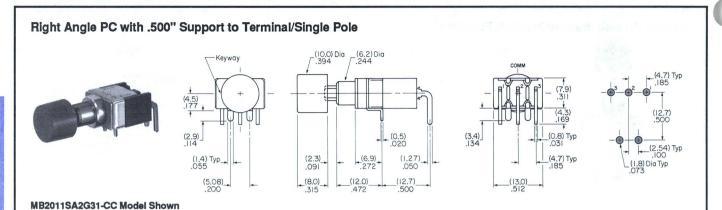






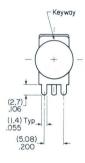


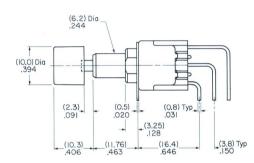
#### **MOMENTARY & ALTERNATE/BRACKETED & ANGLE PC**

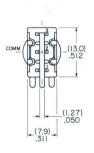


.150" Vertical PC/Single Pole





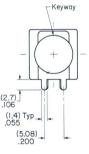


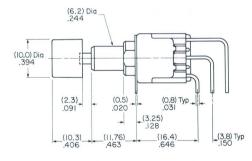


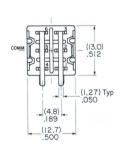
MB2011SS2G40-CC Model Shown

#### .150" Vertical PC/Double Pole



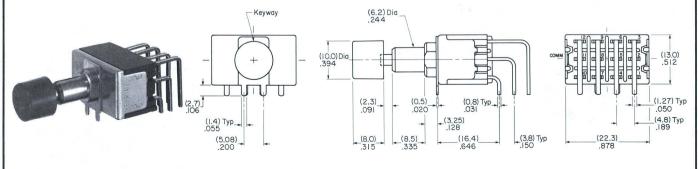






MB2061SS2G40-CC Model Shown

#### .150" Vertical PC/Four Pole



MB2181SS2G40-CC Model Shown

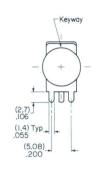
# **DKK**®

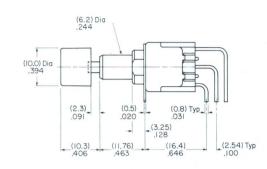
## **SERIES M PUSHBUTTON SWITCHES**

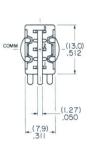
#### **MOMENTARY & ALTERNATE/BRACKETED & ANGLE PC**







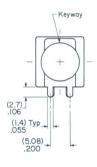


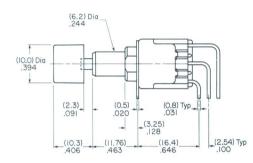


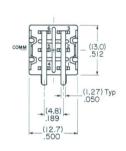
MB2011SS2G45-CC Model Shown

#### .100" Vertical PC/Double Pole



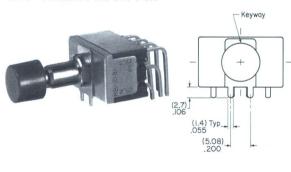


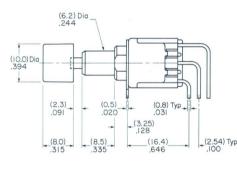


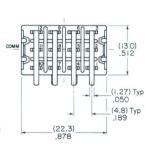


MB2061SS2G45-CC Model Shown

#### .100" Vertical PC/Four Pole



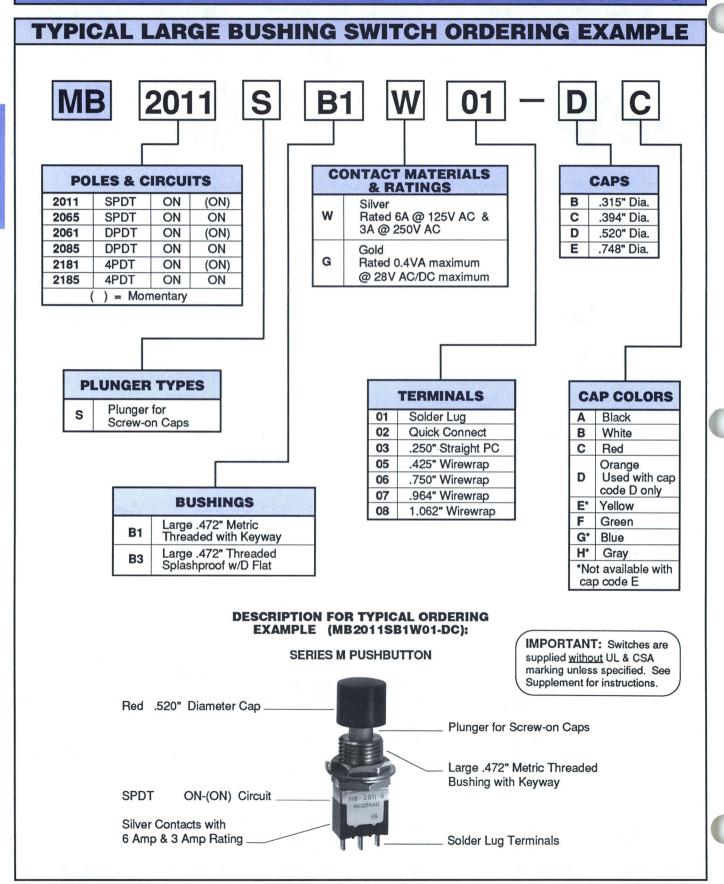




MB2181SS2G45-CC Model Shown

#### PC FOOTPRINTS .150" VERTICAL .100" VERTICAL (3.8) Typ\_▼ .150 (16.4) (16.4) (16.4) (16.4) (1.8) Dia Typ\_/ (I.8) Dia Typ\_/I (1.8) Dia Typ\_1 (1.8) Dia Typ\_f .073 (2.54) Typ\_ .100 (1.8) Dia Typ\_1 (1.8) Dia Typ\_/i (2.54) Typ\_ (2.54) Typ\_ (2.54) Typ\_ (2.54) Typ\_\_\_ (2.54) Typ\_ Single Pole **Double Pole** Four Pole Single Pole **Double Pole** Four Pole

### **MOMENTARY & ALTERNATE/1-4 POLE/LARGE BUSHING**





### & ALTERNATE/1-4 POLE/

#### **POLES & CIRCUITS**

For poles and circuit information, refer to the details contained in the Poles & Circuits Chart appearing in the previous bushing mount section.

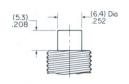
#### **PLUNGER TYPES**

S

Plunger for Screw-on Caps

Plastic for B1 Bushing Metal for B3 Bushing

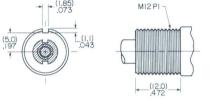
On alternate action models, after transferring circuit, the plunger returns to its original position and does not latch down.



#### BUSHING

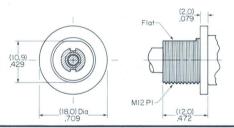
**B1** 

Large .472" **Metric Threaded** with Keyway





Large .472" Threaded Splashproof with D Flat



#### **CONTACT MATERIALS & RATINGS**



Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC



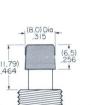
Gold over Brass or Copper Rated 0.4VA max @ 28V AC/DC max

#### CAPS

**AT078** B .315" Dia. Cap

Polystyrene





**AT079** C .394" Dia. Cap Polystyrene



Colors Available: A B C E F

AT414 D .520" Dia. Cap Polystyrene



Colors Available:

ABCDEFGH

**AT412** E .748" Dia. Cap Polystyrene (19.0) Dia .748 Colors Available:

ABCF

#### Color Codes:

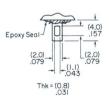
Black **B** White F Green G Blue

C Red H Grav **D** Orange E Yellow

#### **TERMINALS**

01

Solder Lug

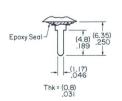


.062" Wide 02 **Quick Connect** 



Corresponds to AMP #60900-1 receptacle 03

250" Straight PC



Wirewrap

.425" 05 (10.8mm).750" 06

(19.05mm)07

(24.5mm)

1.062" 08 (27.0mm)

- (1.17) Thk = (0.8)

Epoxy Seal

Dimension A = wirewrap terminal lengths as shown beside code boxes.

M65

#### **OPTIONAL SPLASHPROOF BOOT**

AT4043 Splashproof Boot

Silicone Rubber

Operating Life: 100,000 for momentary 30,000 for alternate action

When using a splashproof boot, no cap is required.

# (18.0) Dia \_(12.6) Dia .496 (9.6) Dia .378 (4.0) Max .157 (3.5) Min .138

#### SOLDERING & WIRING

#### Soldering:

3 seconds @ 350°C 5 seconds @ 270°C

#### Wiring:

Solder lug terminals have .043" X .079" oblong holes which accommodate 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

#### **OPTIONAL MOUNTER**

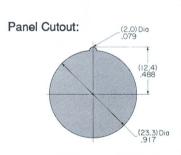
#### **AT528** Snap-in Mounter

Fiberglass reinforced nylon

Black only available Used with .748" diameter cap only

Panel Thickness:

1.0mm - 4.0mm (.039" - .157")



The mounter may be ordered assembled to the switch by entering "AT528" immediately after the switch part number. Mounters may also be ordered separately.

#### **PANEL CUTOUT & PANEL THICKNESS** Without With With Keyway Keyway Locking Ring (12.5) Dia (9.0) (12.5) Dia (1.5)

**Effective Panel Thickness** with Standard Hardware:

5.5mm (.217") maximum

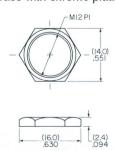
\_(3.0) Dia

	PC BOARD MOUNTING		
Single Pole	Double Pole	Four Pole	
- (4,7) Typ - (4,7) Typ - (1,8) Dia Typ .073			

#### STANDARD MOUNTING HARDWARE PROVIDED WITH SWITCHES

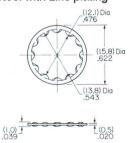
#### AT503 **Hex Nut**

Brass with chrome plating



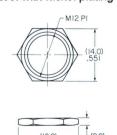
#### **AT508** Lockwasher

Steel with zinc plating



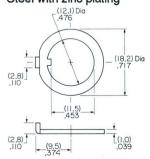
#### AT527M for Metric **Hex Nut**

Steel with nickel plating



#### **AT506 Locking Ring**

Steel with zinc plating



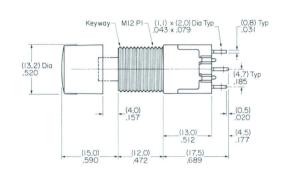
M66 **DKK**®

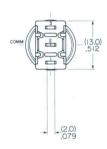
### **MOMENTARY & ALTERNATE/1-4 POLE/LARGE BUSHING**

#### Large Bushing/Solder Lug/Single Pole





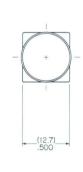


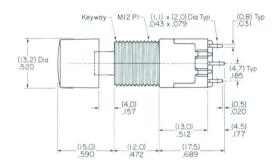


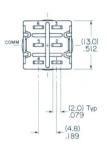
MB2011SB1WO1-DC Model Shown

#### Large Bushing/Solder Lug/Double Pole





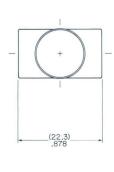


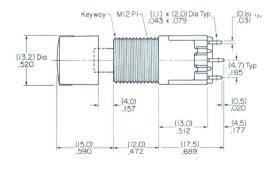


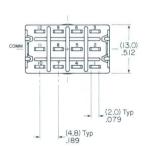
MB2061SB1WO1-DC Model Shown

#### Large Bushing/Solder Lug/Four Pole







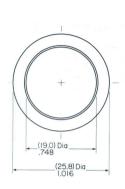


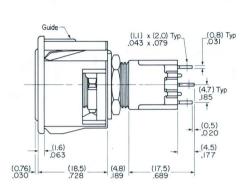
MB2181SB1WO1-DC Model Shown

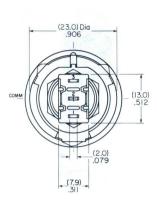
### **MOMENTARY & ALTERNATE/1-4 POLE/LARGE BUSHING**

#### Large Bushing/Solder Lug/Single Pole with Snap-in Mounter



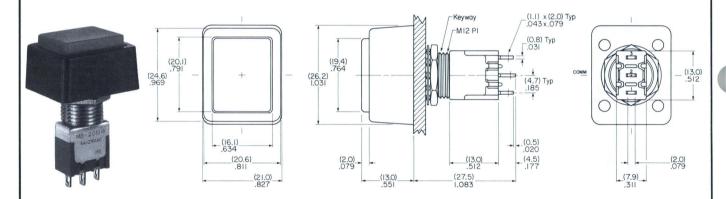






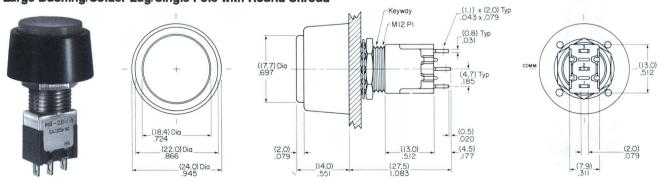
Model shown is MB2011SB1W01 with optional Snap-in Mounter AT528 and .748" Diameter Cap AT412.

#### Large Bushing/Solder Lug/Single Pole with Rectangular Shroud



Model shown is MB2011SB1W01 with optional Rectangular Shroud AT453, Shroud Insert AT452 and Screw Adaptor for Insert AT080. When assembling, use only AT508 and AT527M of the standard hardware provided. For material, color availability and dimensions of these accessories, see the Accessories Section at the end of this catalog.

#### Large Bushing/Solder Lug/Single Pole with Round Shroud



Model shown is MB2011SB1W01 with optional Round Shroud AT455, Shroud Insert AT454 and Screw Adaptor for Insert AT080. When assembling use only AT508 and AT527M of the standard hardware provided. For material, color availability and dimensions of these accessories, see the Accessories Section at the end of this catalog.

### SUBMINIATURE/SNAP ACTION/MOMENTARY/1 & 2 POLE

#### **M SERIES PUSHBUTTONS - MB2400**

MB2400 pushbuttons feature many of the fine characteristics found in the other M Series devices, high torque bushings, stainless steel frame, prominent external insulating barriers, epoxy sealed terminals, internal o-ring for splashproofing, longer center solder lug terminals, and 1500V dielectric strength. In addition, the snap-action contact mechanism results in smooth, light touch actuation. These features exemplify the quality for which NKK is known.

These double throw, momentary devices are available in either single or double pole. A variety of bushings, mounting brackets, terminals and ratings provide users with a wide range of options to meet their specific needs. Accessories, such as: a conical nut, decorative dress nuts and bezels with LEDs may be added to the basic switch to enhance front panel appearance.

This series is divided into three sections by mounting type: Bushing Mount, Bracketed & Angle PC Mount and Snap-in Mount. In the front of each section, a Typical Ordering Example outlines the different options available for that mounting type. Detail pages following each ordering example provide additional information regarding the options outlined and accessories available.

Bushing Mount Pages M69 - M74



Snap-in Mount Pages M80 - M82



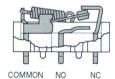
Bracketed & Angle PC Mount Pages M75 - M79



#### **SNAP-ACTING MECHANISM**

The MB2400 pushbutton is a snap-action device usable where short travel and sensitivity of actuation are required. The light touch, snap-acting contact mechanism gives these

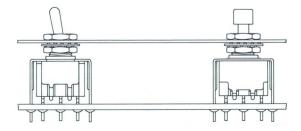
switches
an extremely
smooth feel
and provides
audible
feedback upon
operation.



The contact mechanism is double throw with a normally closed and a normally open contact. This mechanism also provides longer electrical life.

#### **UNIFORM PCB MOUNTING**

Straight PC, with and without brackets, right angle PC and vertical PC models have been especially designed for compatibility with M Series toggles. Uniformity of switch bodies, .280" & .350" bushings and footprints for both toggles and pushbuttons make these devices ideal for mounting next to one another. This feature simplifies design of panel layout, provides convenient mounting of devices with different actuators and facilitates interchangeability of PC boards.



### SUBMINIATURE/SNAP ACTION/MOMENTARY/1 & 2 POLE

#### **GENERAL SPECIFICATIONS**

Electrical Capacity:

(Resistive Load)

3A @ 125V AC

0.4VA maximum @ 28V AC/DC maximum

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

20 milliohms maximum for silver 30 milliohms maximum for gold

Insulation Resistance:

1,000 megohm minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life:

200,000 operations minimum

Electrical Life:

25,000 operations minimum for silver 100,000 operations minimum for gold

**Ambient Temp Range:** 

-15°C through +70°C (+5°F through +158°F) Optional low temperature lubricant available

**Nominal Operating Force:** 

Single Pole Double Pole 250 grams 400 grams

Pretravel:

0.7mm (.027")

Overtravel:

0.3mm (.012")

**Total Travel:** 

1.0mm (.039")

M	ATERIALS & FINISHES
Plunger	Brass with nickel plating
Bushing	Brass with nickel plating
O-ring	Nitrile butadiene rubber
Frame	Stainless steel
Base	Diallylphthalate resin
Case	Polyamide
Movable Contactor	Phosphor bronze with silver or gold plating
Movable Contacts	Silver alloy (code W); silver alloy with gold plating over nickel (code A); or copper with gold plating over nickel (code G)
Stationary Contacts	Silver with silver plating (code W); silver with gold plating over nickel (code A); or copper or brass with gold plating over nickel (code G)
Terminals	Copper or brass with silver plating; copper or brass with gold plating over nickel

#### UL & CSA

All models are recognized

by

Underwriters Laboratories Inc.

and certified by

Canadian Standards Association

for

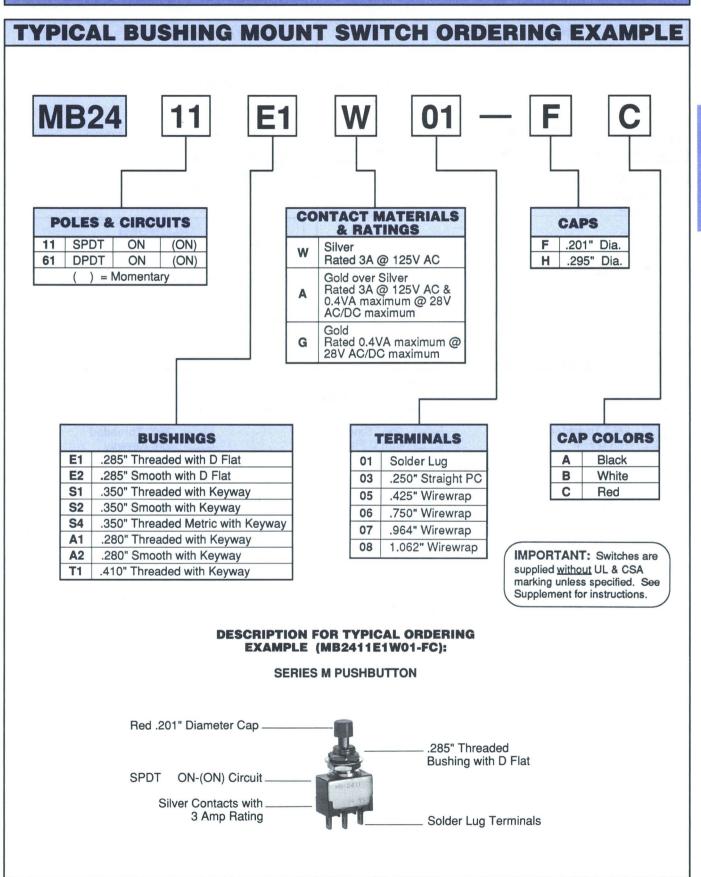
3A @ 125V AC

0.4VA maximum @ 28V maximum AC/DC

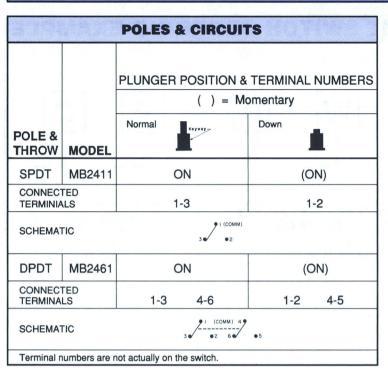
UL File No. E44145

CSA File Nos. LR 23535 and LR56017

### SNAP ACTION/MOMENTARY/1 & 2 POLE/BUSHING MOUNT



### SNAP ACTION/MOMENTARY/1 & 2 POLE/BUSHING MOUNT



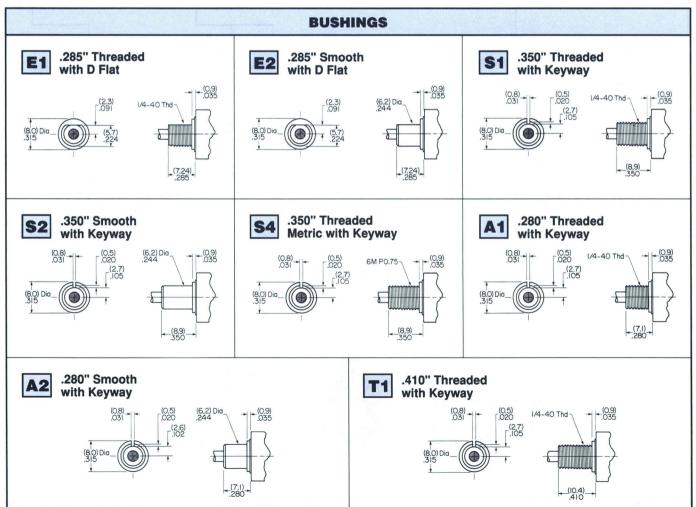
#### **CONTACT MATERIALS & RATINGS**

- Silver over Silver Rated 3A @ 125V AC
- Gold over Silver
  Rated 3A @ 125V AC &
  0.4VA maximum @ 28V AC/DC maximum
- Gold over Brass or Copper Rated 0.4VA maximum @ 28V AC/DC maximum

#### **PLUNGER**

Plunger selection is not required for MB2400 pushbuttons. The plunger can be used with or without a cap.





### ACTION/MOMENTARY/1

#### **TERMINALS**

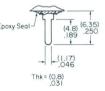
01

Solder Lua



03

.250" Straight PC



#### Wirewrap

.425" 05 (10.8mm)

.750" 06 (19.05mm)



1.062" 80 (27.0mm)

> Dimension A = wirewrap terminal lengths as shown beside code boxes.



**AT475** 



.201" Diameter Cap



CAPS

H

**AT496** .295" Diameter Cap

Polycarbonate





Colors Available:

A Black

**B** White

C Red

#### **DECORATIVE HARDWARE**

Decorative hardware is available for MB2400 pushbuttons. Conical nut, AT512, two sizes of dress nuts, AT532 or AT533, and a knurled face nut, AT501, are available in either inch or metric dimensions. Detailed illustrations of this hardware is included in the hardware section at the end of this catalog.

#### **SOLDERING & WIRING**

Soldering:

3 seconds @ 350°C

5 seconds @ 270°

Wiring:

Solder lug terminals have .043" X .079" oblong holes which accommodate 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

#### **PANEL THICKNESS**

Panel Thickness with Standard Hardware:

For .285" Bushing:

1.74mm (.068") maximum

For .350" Bushing:

3.40mm (.134") maximum

PC BOARD MOUNTING		
Single Pole	Double Pole	
- (4.7) Typ - (3.7) Typ - (3.85) Typ - (1.8) Dia Typ		

PANEL CUTOUTS			
Without Keyway	With Keyway	With D Flat	With Locking Ring
-(6,5) Dia -(256	(6.5) Dia - (5.6) - (5.6) - (220 - (0.6) - (0.24)	- (5.8) - (5.8) - (6.5) Dia - (6.5) Dia	-(6.5) Dia -256 -(6.5) -256 -22) Dia -087

### ION/MOMENTARY/1

#### STANDARD HARDWARE

AT513H for Inch AT513M for Metric **Hex Nut** 

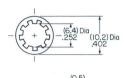
Brass, nickel plated





AT509 Lockwasher

Steel, chromate over zinc plating

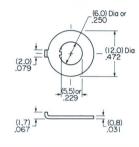


Hardware included with each switch: Two AT513 (H or M) and one AT509.

#### **OPTIONAL HARDWARE**

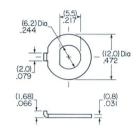
AT507H for Inch AT507M for Metric Locking Ring

Steel, chromate over zinc plating



AT515 **Locking Ring** for D Flat Bushing

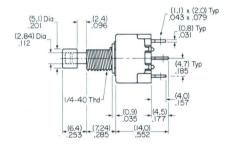
Steel, chromate over zinc plating

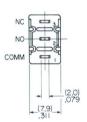


#### Solder Lug/Single Pole







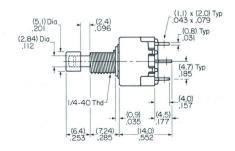


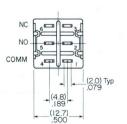
MB2411E1WO1-FC Model Shown

#### Solder Lug/Double Pole





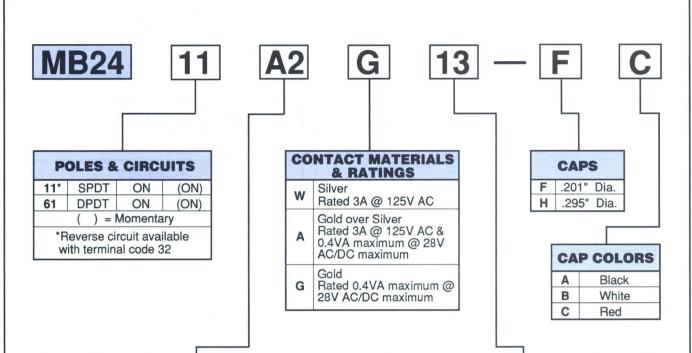




MB2461E1WO1-FC Model Shown





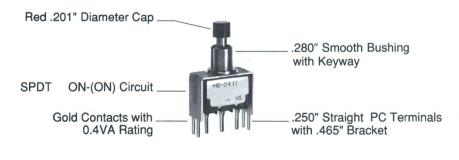


	BUSHINGS
<b>A</b> 1	.280" Threaded with Keyway
A2	.280" Smooth with Keyway
S1	.350" Threaded with Keyway
S2	.350" Smooth with Keyway
E1	.285" Threaded with D Flat
E2	.285" Smooth with D Flat
T1	.410" Threaded with Keyway
H2	.180" Smooth without Keyway Combines with bracketed straight PC terminals only

#### **DESCRIPTION FOR** TYPICAL ORDERING EXAMPLE (MB2411A2G13-FC):

#### **SERIES M PUSHBUTTON**

	TERMINALS	
	With Bracket	
13	.250" Straight PC with .465" Bracket	
15	.425" Straight PC with .630" Bracket	
17	.964" Straight PC with 1.150" Bracket	
	With Reinforced Bracket	
23	.250" Straight PC with .465" Bracket	
25	.425" Straight PC with .630" Bracket	
26	.750" Straight PC with .953" Bracket	
	With Terminal Support	
30	Right Angle PC	
33	Right Angle PCB Single pole & 0.4VA rating only	
32	Right Angle PCB with Reverse Circuit Single pole & 0.4VA rating only	
40	Vertical PC	



**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.



### SNAP ACTION/MOMENTARY/BRACKETED & ANGLE PC

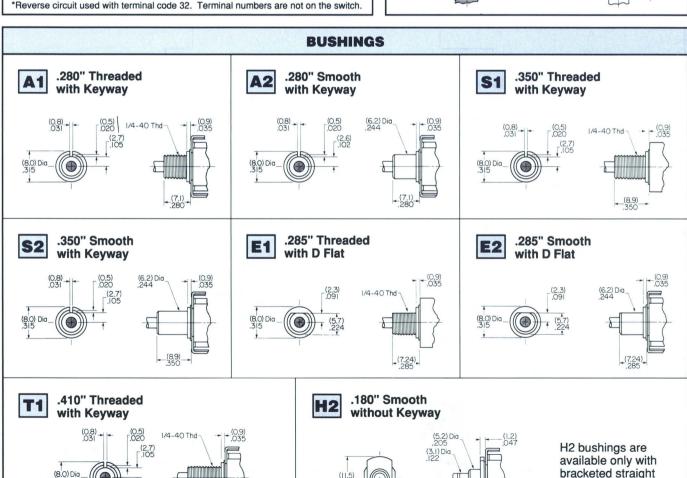
#### **POLES & CIRCUITS** PLUNGER POSITION & TERMINAL NUMBERS ( ) = Momentary Normal Down POLE & **THROW** MODEL SPDT MB2411' ON (ON) CONNECTED TERMINIALS 1-3 1-2 **SCHEMATIC** DPDT MB2461 ON (ON) CONNECTED TERMINALS 1-3 4-6 1-2 4-5 SCHEMATIC \*Reverse circuit used with terminal code 32. Terminal numbers are not on the switch.

#### **CONTACT MATERIALS & RATINGS**

- Silver over Silver W Rated 3A @ 125V AC
- Gold over Silver Rated 3A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum
- Gold over Brass or Copper G Rated 0.4VA maximum @ 28V AC/DC maximum

#### **PLUNGER** Plunger selection is not required for MB2400 pushbuttons. The plunger can be used with or without a cap. (2.84) Dia (2.84) Dia Standard Plunger with Plunger H2 Bushing

PC terminals and are supplied with a .158" long plunger.





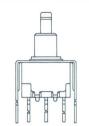
## SNAP ACTION/MOMENTARY/BRACKETED & ANGLE PC

#### **TERMINALS**

.250" Straight PC with .465" Bracket

.425" Straight PC with .630" Bracket

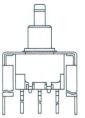
7 .964" Straight PC with 1.150" Bracket



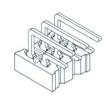
.250" Straight PC with .465" Reinforced Brkt.

.425" Straight PC with .630" Reinforced Brkt.

.750" Straight PC with .953" Reinforced Brkt.



Right Angle PC



Right Angle PCB



Available only in single pole with 0.4VA rating

Right Angle PCB with Reverse Circuit



Available only in single pole with 0.4VA rating

40

**Vertical PC** 



#### CAPS



AT475 .201" Diameter Cap

Polycarbonate





With Std. Bushing

H

AT496 .295" Diameter Cap

Polycarbonate





With Std. Bushing

**Colors Available:** 

A Black

**B** White

C Red

#### HARDWARE

Standard hardware included with each threaded bushing is: two hex nuts, AT513 (H or M) and one lockwasher, AT509. Optional locking rings, AT507 (H or M) and AT515 are also available. This hardware appears in the previous bushing mount section. Decorative hardware: conical nut, AT512, two sizes of dress nuts, AT532 or AT533, and a knurled face nut, AT501, are suitable for use with these switches. Detailed illustrations of this hardware is included in the hardware section.

#### SOLDERING

3 seconds @ 350°C

5 seconds @ 270°C

#### **PANEL THICKNESS**

With Standard Hardware:

For .280" Bushing: 1.74mm (.068") max. For .350" Bushing: 3.40mm (.134") max.

PANEL CUTOUTS			
Without Keyway	With Keyway	With D Flat	With Locking Ring
-(6,5) Dia .256	(6.5) Dia -256 (5.6) -220 -(0.6)	- (5,8) 228 - (6,5) Dia .256	(6.5) Dia -256 -(6.5) -256 -(2.2) Dia .087

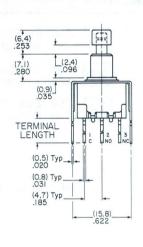


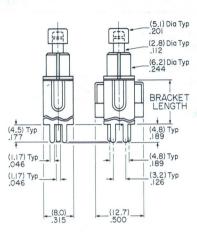
#### Straight PC with Bracket/Single & Double Pole

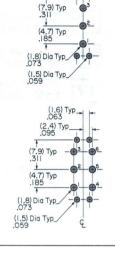


MB2411A2G13-FC Model Shown

Terminal Code	Terminal Length	Bracket Length
13	.250" (6.4mm)	.465" (11.8mm)
15	.425" (10.8mm)	.630" (16.0mm)
17	.964" (24.5mm)	1.150" (29.2mm)







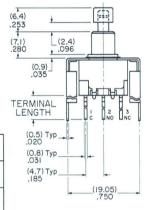
(3.18) Typ .125

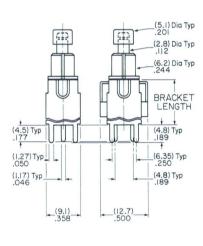
#### Straight PC with Reinforced Bracket/Single & Double Pole

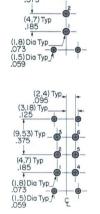


MB2411A2G23-FC Model Shown

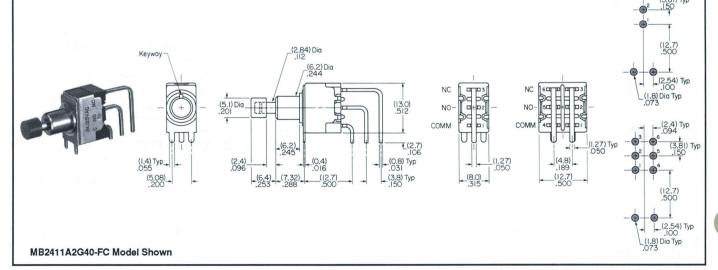
Terminal	Bracket
Length	Length
.250"	.465"
(6.4mm)	(11.8mm)
.425"	.630"
(10.8mm)	(16.0mm)
.750"	.953"
(19.05mm)	(24.2mm)
	Length .250" (6.4mm) .425" (10.8mm)







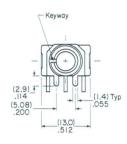
#### Vertical PC/Single & Double Pole

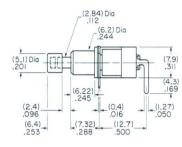


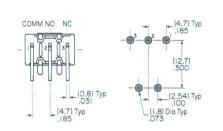
M78

#### Right Angle PC/Single Pole





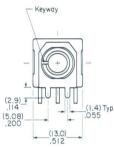


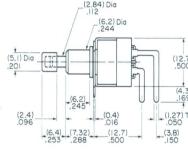


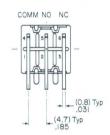
MB2411A2G30-FC Model Shown

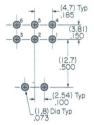
#### Right Angle PC/Double Pole







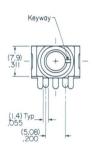


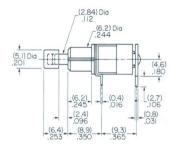


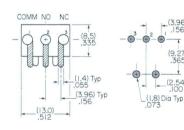
MB2461A2G30-FC Model Shown

#### Right Angle PCB/Single Pole





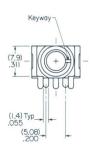


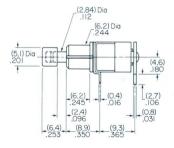


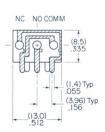
MB2411A2G33-FC Model Shown

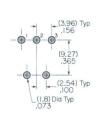
#### Right Angle PCB/Single Pole/Reverse Circuit





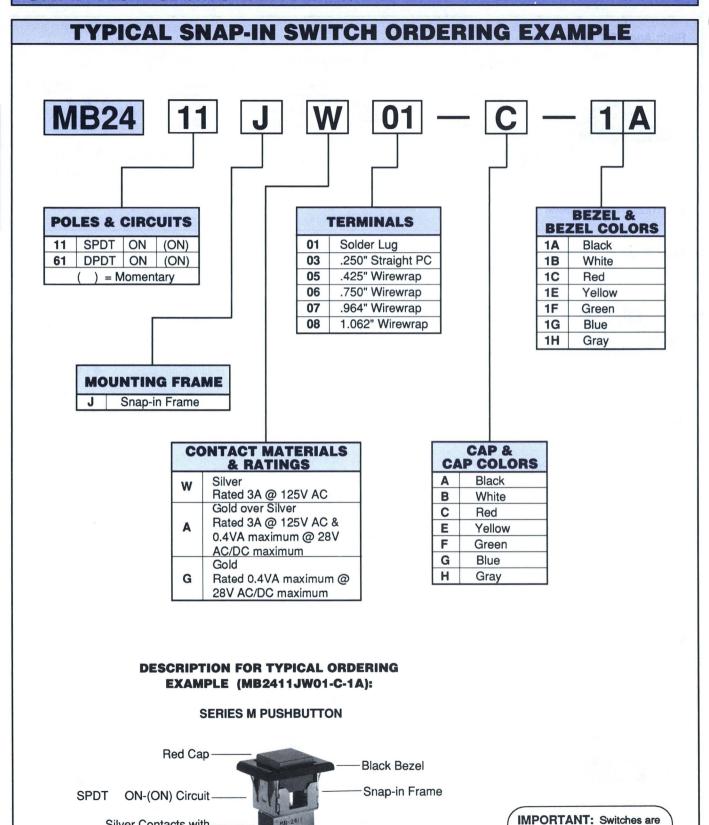






MB2411A2G32-FC Model Shown

#### SNAP ACTION/MOMENTARY/1 & 2 POLE/SNAP-IN MOUNT



**NKK®** 

Silver Contacts with

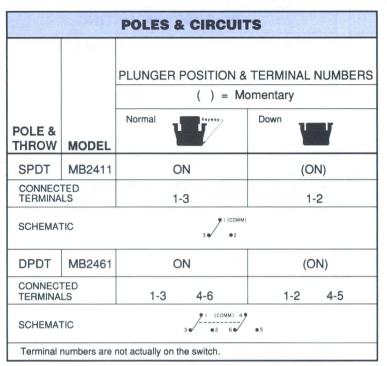
3 Amp Rating

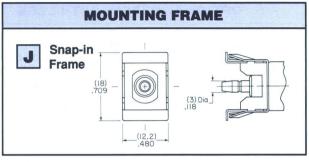
Solder Lug Terminals

supplied without UL & CSA

Supplement for instructions.

marking unless specified. See





#### **CONTACT MATERIALS & RATINGS**

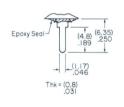
- Silver over Silver W Rated 3A @ 125V AC
- Gold over Silver Rated 3A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum
- Gold over Brass or Copper G Rated 0.4VA maximum @ 28V AC/DC maximum



01 Solder Lug



03 .250" Straight PC



.425" (10.8mm)

.750" 06 (19.05mm).964" 07

(24.5mm)1.062" 08 (27.0mm)

Dimension A = wirewrap terminal lengths as shown beside code boxes.

Wirewrap

#### **CAP & CAP COLORS**

Colors Available:

A Black

White

Blue

**AT465** .453" Square

Polycarbonate

C Red E Yellow Green

Standard finish is shiny.

H Gray

G

B

Contact factory for matte finish.

#### **OPTIONAL BEZEL & BEZEL COLORS**

**AT207** 1 **Bezel** 

Polycarbonate

Standard finish is shiny.

Contact factory for matte finish.

**Colors Available:** 

**Black** 

White

Red

Yellow

Green

G Blue

Gray

**gwitches** • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

#### SNAP ACTION/MOMENTARY/1 & 2 POLE/SNAP-IN MOUNT

#### **OPTIONAL BEZELS WITH LEDS**

Several bezels with LEDs, AT208, AT212 and AT213 are available for use with MB2400 pushbuttons. Dimension drawings, panel cutouts, LED color codes and LED lamp specifications appear in Series E Snap-in Pushbutton Section (EB). Bezel assembly instructions may be found in Series M Snap-in Rocker Section. When ordering, specify both the bezel AT number and the LED color code.

PC BOARD MOUNTING	
Single Pole	Double Pole
13	
- ⊕ - <del>1</del> (4.7) Typ - ⊕185	
-@	
(1.8) Dia Typ .073	(1.8) Dia Typ .073

#### SOLDERING

Soldering time and temperature limits:

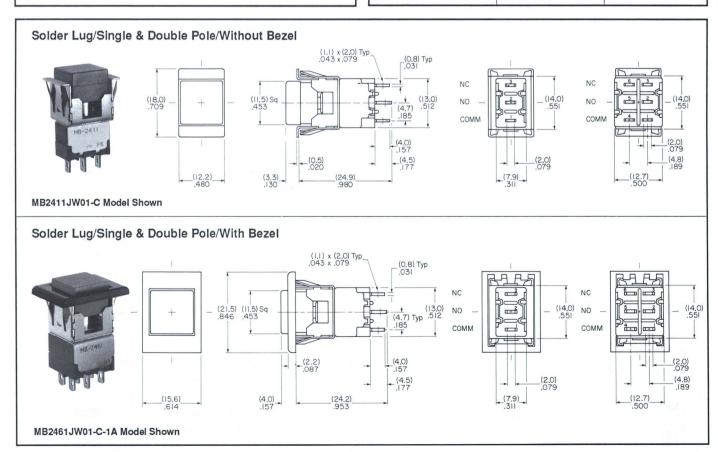
3 seconds @ 350°C

5 seconds @ 270°C

#### WIRING

Solder lug terminals have .043" X .079" oblong holes which accommodate 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

#### **EFFECTIVE PANEL THICKNESS & CUTOUTS** 1.0mm ~ 4.0mm **Panel Thickness** $(.039" \sim .157")$ without Bezel **Panel Thickness** 1.0mm ~ 3.2mm with Bezel $(.039" \sim .126")$ Single Pole **Double Pole Panel Cutouts** (15.0) (12.5) (13.1)



# **NKK** SERIES M SLIDE SWITCHES

### SUBMINIATURE/POWER & LOGIC LEVEL

#### **FEATURES**

Crisp actuation clearly indicates the circuit status.

High internal barriers between poles and insulating sheet between case and actuator block give added protection to contacts.

Specially composed silver alloy contacts for power applications or gold contacts for logic-level applications give high contact reliability.

Clinching of frame to case well above base for high dielectric strength.

Standoffs prevent contamination during soldering on PC board.

Epoxy sealed terminals prevent entry of flux, solvents, and other contaminants.

All nonilluminated models are certified by CSA and recognized by UL.



**For Silver Contacts** 

6A @ 125V AC 3A @ 250V AC

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 1,000V AC minimum between contacts 1,500V AC min. between contacts & case

Mechanical Life: 100,000 operations minimum for nonilluminated 50,000 operations minimum for illuminated

Electrical Life: 25,000 operations minimum

Total Travel: 2.2mm (.087") for on-none-on nonilluminated

and all illuminated

3.5mm (.138") for on-off-on & on-on-on nonilluminated

Ambient Temp Range: -10°C ~ +70°C (+14°F ~ +158°F) for nonilluminated

-10°C ~ +55°C (+14°F ~ +131°F) for illuminated

**For Gold Contacts** 

0.4VA maximum @ 28V AC/DC maximum (Applicable Range: 0.1mA ~ 0.1A @ 20mV ~ 28V)

20 milliohms maximum

1,000 megohms minimum @ 500V DC

1,000V AC minimum between contacts 1,500V AC min. between contacts & case

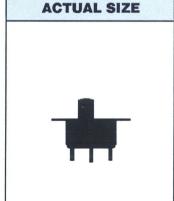
100,000 operations minimum

50,000 operations minimum

2.2mm (.087") for on-none-on nonilluminated and all illuminated

3.5mm (.138") for on-off-on & on-on-on

nonilluminated



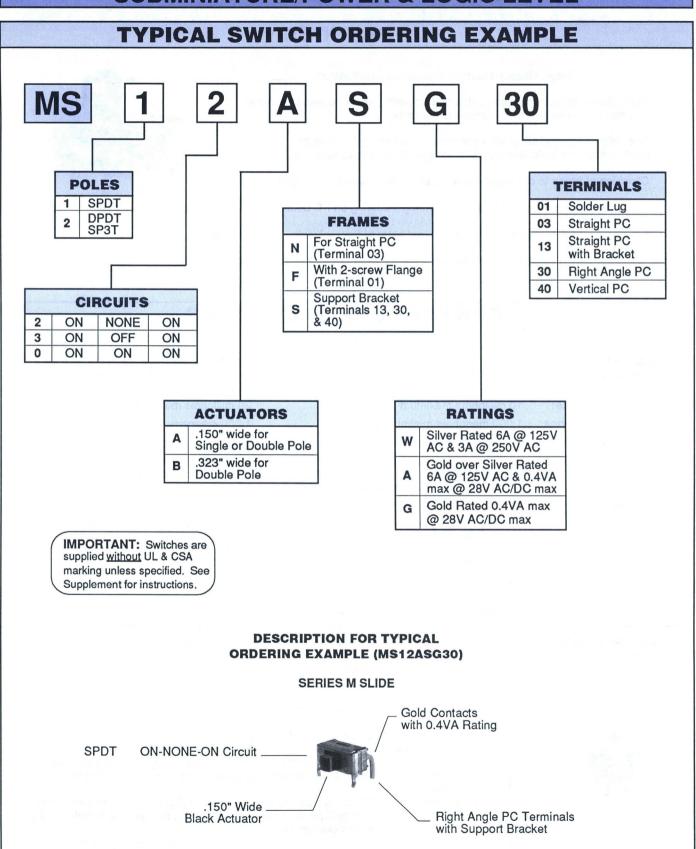
**Electrical Capacity:** 

(Resistive Load)

0019 Mariana	MATERIALS & FINISHES
Actuator	Polyamide (UL 94V-2) or glass fiber reinforced polyester (UL 94V-0)
Frame	Stainless steel
Case	Glass fiber reinforced diallylphthalate resin (UL-94V-0)
Movable Contacts	Silver alloy (code W); or silver alloy with gold plating over nickel (code A); or copper with gold plating over nickel (code G)
Stationary Contacts	Silver capped copper with silver plating (code W); or silver alloy with gold plating over nickel (code A); or copper with gold plating over nickel (code G)
Terminals	Copper or brass with silver plating; copper or brass with gold over nickel plating.

# **NKK** SERIES M SLIDE SWITCHES

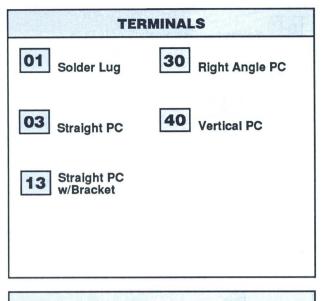
### SUBMINIATURE/POWER & LOGIC



# **SERIES M SLIDE SWITCHES**

# SUBMINIATURE/POWER & LOGIC LEVEL

POLES AND CIRCUITS				
		SLIDE POSITION & TERMINAL NUMBERS		
		Down	Center	Up
POLE & THROW	MODEL			
SPDT	MS12 MS13	ON ON	NONE OFF	ON ON
CONNECT TERMINA		2-1	OPEN	2-3
SCHEMATIC		92 (COMM) •3		
DPDT	MS22 MS23	ON ON	NONE OFF	ON ON
CONNECTED TERMINALS		2-1 5-4	OPEN	2-3 5-6
SCHEM	ATIC		2 (COMM) 59 •3 4• •6	
SP3T	MS20	ON	ON	ON
CONNECTED TERM'S W/O EXTERNAL CONNECTIONS		2-1 5-4	2-1 5-6	2-3 5-6
SCHEMATICS		External Connection 2(in) 5 1(out) 3 4(out) 6(out)	External Connection 7 5 5 1 (out) 3 4 (out) 6 (out)	External Connection— 2(in) 5  I(out) 3 4(out) 6(out)



#### **SOLDERING & WIRING**

**Time & Temperature Limits** 3 seconds @ 350°C or 5 seconds @ 270°C

Wiring Specs The .043" X .079" hole accommodates 1 solid 18 gauge wire or 2 solid or stranded 20 gauge wires

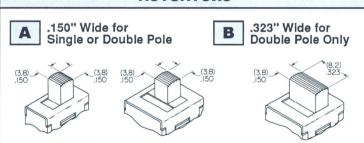
**ACTUATORS** 

The SP3T model is a conversion of the DPDT.

Terminal numbers are not actually on the switch.

The external connections must be made

during field installation.



## **CONTACT MATERIALS & RATINGS**

Silver over Silver Rated 6A @ 125V AC & 3A @ 250V AC

Gold over Silver Rated 6A @ 125V AC & 0.4VA max @ 28V AC/DC max

Gold over Brass or Copper G Rated 0.4VA maximum @ 28V AC/DC maximum

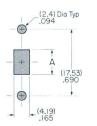
Note: Contacts are nonshorting (break before make).

#### PANEL MOUNTING

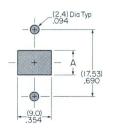
**Maximum Effective Panel Thickness** 4.5mm (.177") for angle mount terminals 5.0mm (.197") for others

#### Dimension A:

6.8mm (.268") for on-none-on models 8.1m (.319") for on-off-on & on-on-on models



For Single or Double Pole with .150" Actuator



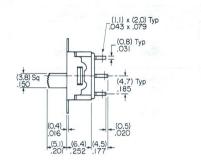
For Double Pole Only with .323" Actuator

M85

# KK SERIES M SLIDE SWITCHES



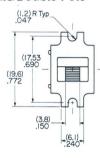
MS12AFW01 Model Shown

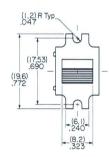


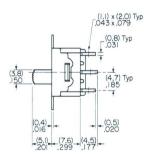
Actuator Shown in Down Position

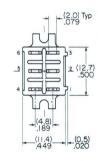
#### 01 Solder Lug Terminals/Double Pole









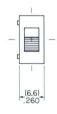


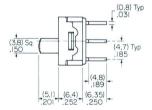
MS22BFW01 Model Shown

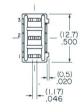
Actuator Shown in Down Position

#### 03 Straight PC Terminals/Single Pole









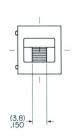


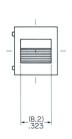
MS12ANG03 Model Shown

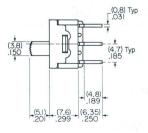
Actuator Shown in Down Position

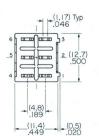
#### 03 Straight PC Terminals/Double Pole

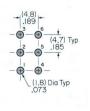












MS22BNG03 Model Shown

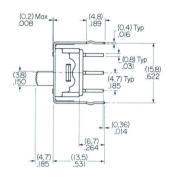
Actuator Shown in Down Position

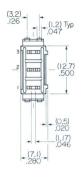
# **SERIES M SLIDE SWITCHES**

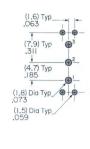










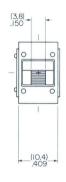


MS12ASG13 Model Shown

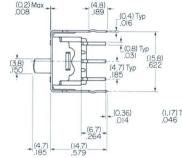
Actuator Shown in Down Position

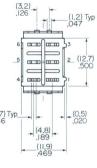
13 Straight PC Terminals with Bracket/Double Pole

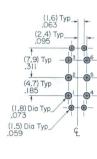










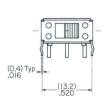


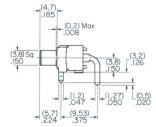
MS22BSG13 Model Shown

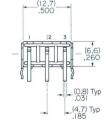
Actuator Shown in Down Position

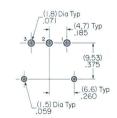
30 Right Angle PC Terminals/Single Pole











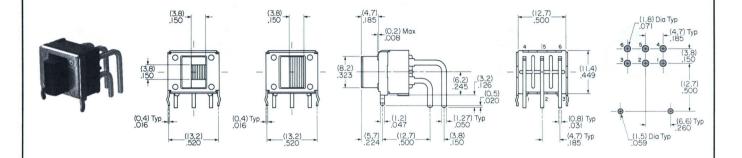
MS12ASG30 Model Shown

Actuator Shown in Down Position

# **NKK** SERIES M SLIDE SWITCHES

# SUBMINIATURE/POWER & LOGIC LEVEL



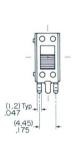


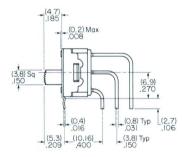
MS22BSG30 Model Shown

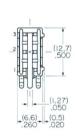
Actuator Shown in Down Position

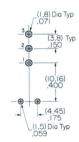
Vertical PC Terminals/Single Pole







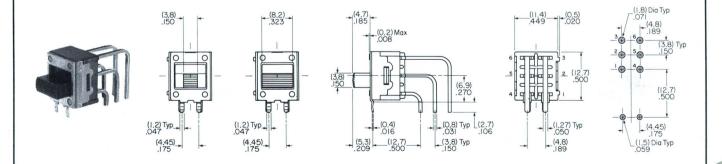




MS12ASG40 Model Shown

Actuator Shown in Down Position

## Vertical PC Terminals/Double Pole

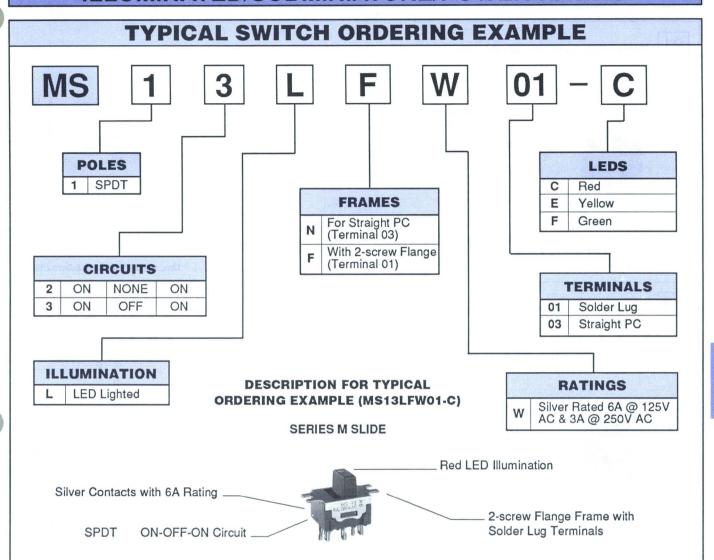


MS22BSG40 Model Shown

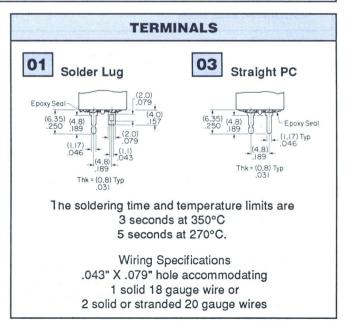
Actuator Shown in Down Position

# **NKK** SERIES M SLIDE SWITCHES

# ILLUMINATED/SUBMINIATURE/POWER RATING



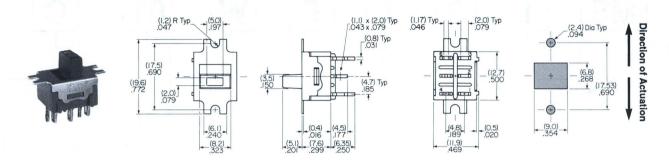
		SLIDE POSITION & TERMINAL NUMBERS			
POLE & THROW	MODEL	Down	Center	Up	
SPDT	MS12	ON	NONE	ON	
CONNECT POWER T	TED ERMINALS	2-1	NONE	2-3	
LED ILL	UMINATION	ON	NONE	ON	
CONNECTED LAMP TERMINALS		4-6	NONE	4-6	
DPDT	MS13	ON	OFF	ON	
CONNECTED POWER TERMINALS		2-1	OPEN	2-3	
LED ILLUMINATION		ON	ON	ON	
CONNECTED LAMP TERMINALS		4-6	4-6	4-6	
SCHEMATIC		2 (COMM)	Note: LED circuit is isolated & requires an external switch.		



# **NKK®** SERIES M SLIDE SWITCHES

## ILLUMINATED/SUBMINIATURE/POWER RATING



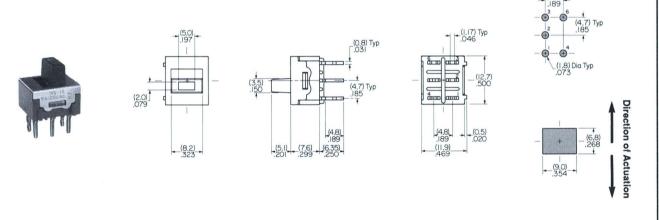


MS12LFW01-C Model Shown

Actuator Shown in Down Position

Max. Panel Thickness: 5.0mm (.197")

# O3 Straight PC Terminals/Single Pole

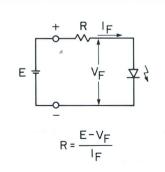


MS12LNW03-C Model Shown

Actuator Shown in Down Position

Max. Panel Thickness: 5.0mm (.197")

#### **ELECTRICAL SPECIFICATIONS FOR SINGLE ELEMENT LED**



Where: R = Resistor Value (Ohms) E = Source Voltage (V)

V<sub>F</sub> = Forward Voltage (V)

I<sub>E</sub> = Forward Current (mA)

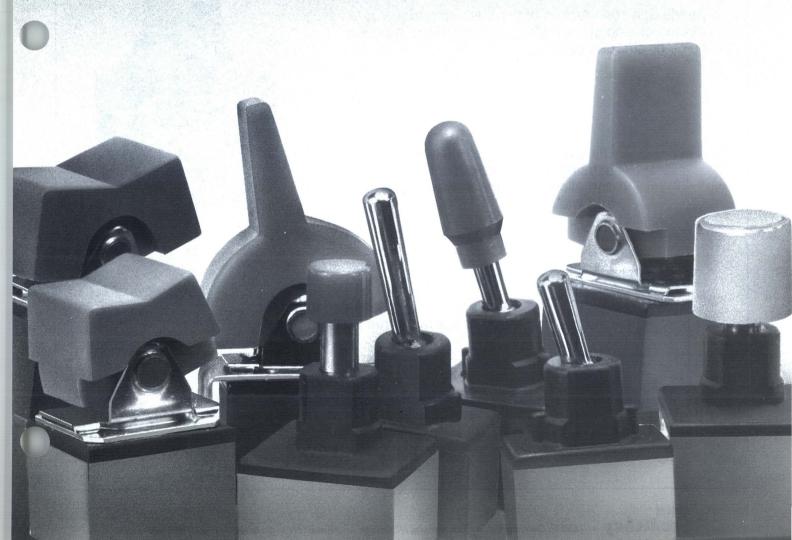
		Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	20ma	20mA	20mA
Continuous Forward Current	ľ <sub>F</sub>	16mA	16mA	16mA
Forward Voltage	V <sub>F</sub>	2.07V	2.15V	2.16V
Reverse Peak Voltage	V <sub>RM</sub>	3V	4V	4V
Current Reduction Rate Above 25°C	$\Delta l_{_{\rm F}}$	0.27mA/°C	0.27mA/°C	0.27mA/°C

The electrical specifications shown above are determined at a basic temperature of 25°C. If the source voltage exceeds the LED's rated voltage, the required ballast resistor value can be calculated by using the accompanying formula.

# SERIES M2

# **SWITCHES**

- TOGGLES ROCKERS
  - **PUSHBUTTONS**



# NKK SERIES M2

## SUBMINIATURE/WASHABLE/PCB MOUNTING

## **DISTINCTIVE FEATURES**

An o-ring surrounding the toggle above the ball joint serves as a bushing seal to prevent entry of dust or liquids which might splash on the switch.

Antijamming actuator design protects — against mechanism damage from downward force on the toggle or plunger.

Single unit construction of the bushing and top ——of the housing gives added protection from washing fluids or other liquids.

Ultrasonic welding of the bushing & — housing units seals out contaminants and allows automated wave soldering and washing.





Terminals are epoxy sealed to prevent entry of flux and other contaminants.

Logic level and power capabilities are available to suit varying customer applications.

# **NKK** SERIES M2 TOGGLES & ROCKERS

## SUBMINIATURE/WASHABLE/PCB MOUNTING

## **GENERAL SPECIFICATIONS**

#### For Silver Contacts

Electrical Capacity: 6A @ 125V AC or 3A @ 250V AC (Resistive Load) 4A @ 30V DC (ON-ON circuit)

3A @ 30V DC (all other circuits)

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 1,000 megohms minimum @ 500V DC

**Dielectric Strength:** 1,000V AC minimum between contacts

1,500V AC min. between contacts & case

-10°C through +70°C (+14°F through +158°F)

Mechanical Life: 100,000 operations minimum for toggles

50,000 operations min. for rockers

Electrical Life: 25,000 operations minimum

Angle of Throw: 2

Ambient Temp Range:

#### **For Gold Contacts**

0.4VA maximum @ 28V AC/DC maximum (Applicable Range: 0.1mA ~ 0.1A @ 20mV ~ 28V)

20 milliohms maximum

1,000 megohms minimum @ 500V DC

1,000V AC minimum between contacts 1,500V AC min. between contacts & case

100,000 operations minimum for toggles 50,000 operations min. for rockers

50,000 operations minimum

26°

MATERIALS & FINISHES			
Toggle/Lever	Brass (chrome plated for toggles & nickel plated lever for rockers)		
Mounting Frame	Chrome over brass		
Bushing/Housing Fiberglass reinforced polyamide			
Sealing Ring	Nitrile butadiene rubber		
Base	Fiberglass reinforced polyamide		
Movable Contacts	Copper or brass with gold over nickel (logic level); silver alloy with silver plating (power)		
Stationary Contacts  Copper or brass with gold over nickel (logic lev silver alloy with silver plating (power)			
Terminals	Copper or brass with silver or gold plating		

#### **UL & CSA**

#### UL File No. E44145:

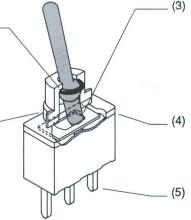
Models rated 6A @ 125V AC, 3A @ 250V AC, 4A @ 30V DC, and 0.4VA @ 28V AC/DC are recognized by Underwriters Laboratories Inc.

#### CSA File Nos. LR23535 and LR56017:

Models rated 6A @ 125V AC, 3A @ 250V AC, and 0.4VA @ 28V AC/DC are certified by Canadian Standards Association.

#### **WASHABILITY & ANTIJAMMING DESIGN**

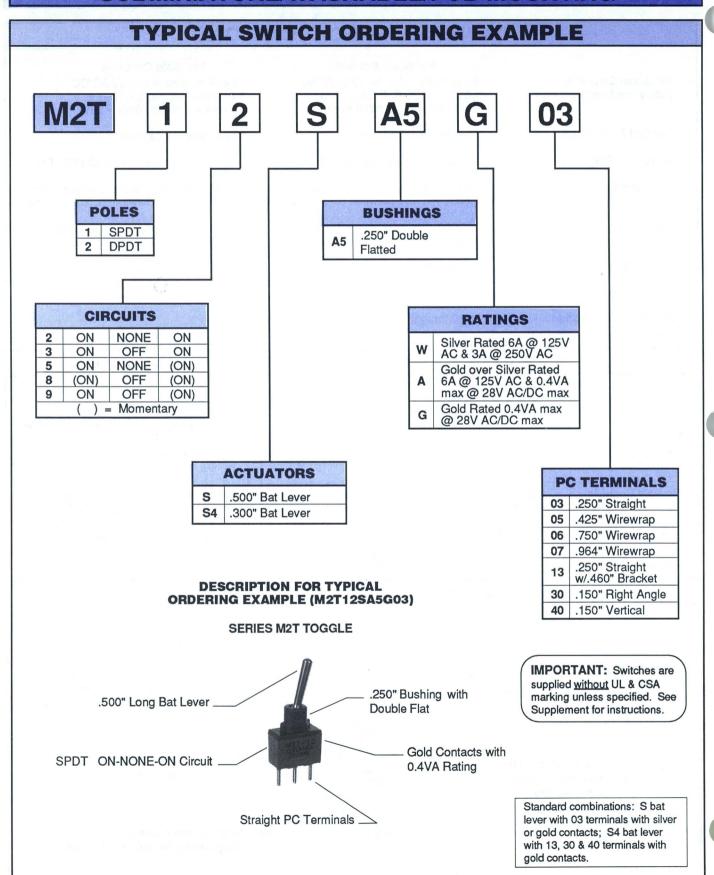
- (1) The interior bushing area is sealed with an o-ring which surrounds the toggle. (The switch should not be actuated during washing.)
- (2) The bushing and top of the housing are one molded piece thus achieving the exterior bushing seal.



- (3) The step at the bottom of the toggle joint and a plate at the top of the housing resist downward movement of the lever and protect the contact mechanism.
- (4) Ultrasonic welding is used to seal the bushing unit to the base.
- (5) Terminals are epoxy sealed for safeguarding the switch at the base.

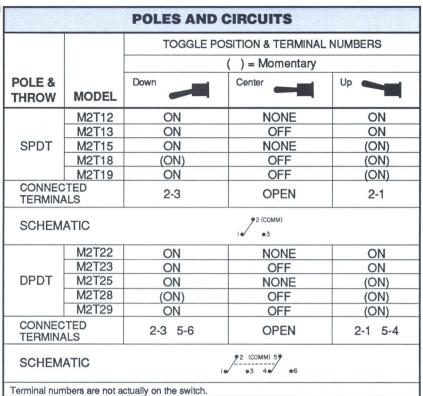
# **NKK** SERIES M2 TOGGLE SWITCHES

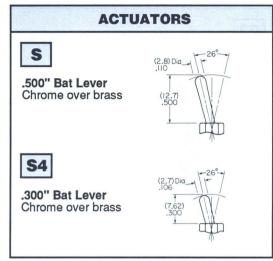
## SUBMINIATURE/WASHABLE/PCB MOUNTING

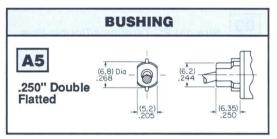


# **KK** SERIES M2 TOGGLE SWITCHES

# SUBMINIATURE/WASHABLE/PCB MOUNTING







#### RATINGS

W

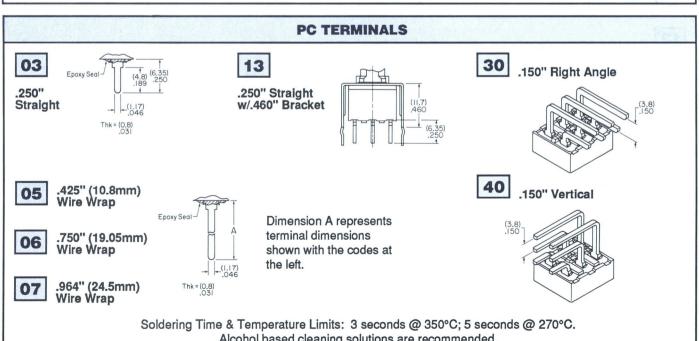
Silver over Silver 6A @ 125V AC & 3A @ 250V AC

A

Gold over Silver 6A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum

G

Gold 0.4VA maximum @ 28V AC/DC maximum



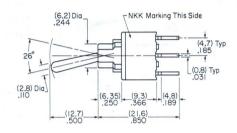
Alcohol based cleaning solutions are recommended.

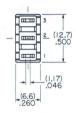
# **SERIES M2 TOGGLE SWITCHES**













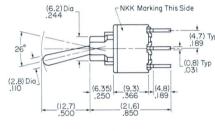
M2T12SA5G03 Model Shown

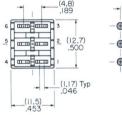
Actuator in DOWN position.

#### 03 Straight PC Terminals/Double Pole









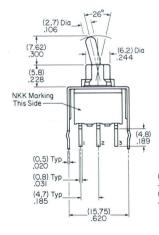
(1.8) Dia Typ 073

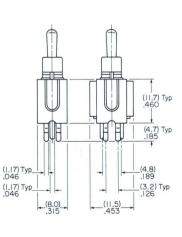
M2T22SA5G03 Model Shown

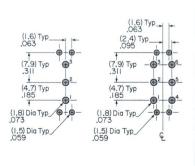
Actuator in DOWN position.

#### 13 Straight PC Terminals with Bracket/Single & Double Pole









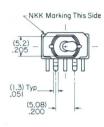
M2T12S4A5G13 Model Shown

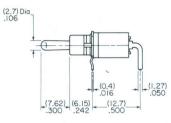
Actuator in DOWN position.

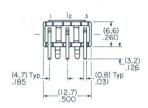
# **NKK** SERIES M2 TOGGLE SWITCHES

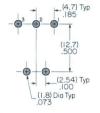










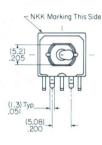


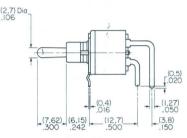
M2T12S4A5G30 Model Shown

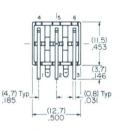
Actuator in DOWN position.

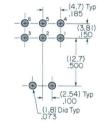
#### 30 Right Angle PC Terminals/Double Pole











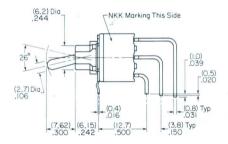
M2T22S4A5G30 Model Shown

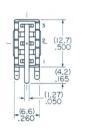
Actuator in DOWN position.

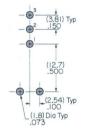
#### 40 Vertical PC Terminals/Single Pole









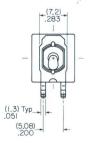


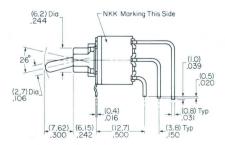
M2T12S4A5G40 Model Shown

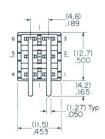
Actuator in DOWN position.

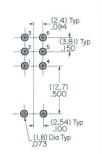
#### 40 Vertical PC Terminals/Double Pole









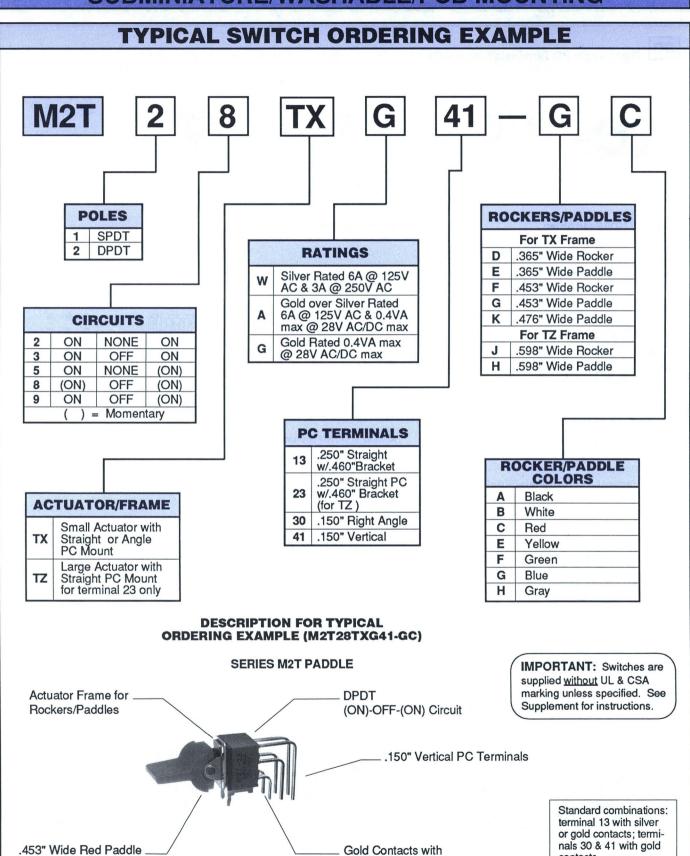


M2T22S4A5G40 Model Shown

Actuator in DOWN position.

# **NKK** SERIES M2 ROCKER SWITCHES

## INIATURE/WASHABLE/PCB MOUNTING



0.4VA Rating

contacts.

# **NEW SERIES M2 ROCKER SWITCHES**

## SUBMINIATURE/WASHABLE/PCB MOUNTING

#### **ADDITIONAL DETAIL**

See page N5 for details concerning Poles & Circuits, Contact Materials & Ratings. Terminal details are on page N5 and on following dimension drawings.

#### **ACTUATOR/MOUNTING FRAME**

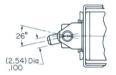
TX

Small Actuator with Straight or Angle PC Mount

The TX code describes a device which accepts a small actuator and mounts to a PC board with a bracket or support depending upon terminal selected. Note: For use with terminal codes 13, 30, and 41.

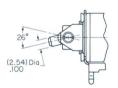
#### Straight PC Mounting





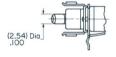
#### **Vertical PC Mounting**





#### Right Angle PC Mounting

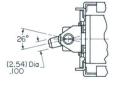




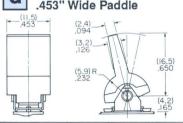
#### Large Actuator with Straight PC Mount TZ

The TZ code describes a device which accepts a large actuator and mounts to a PC board with a bracket. Note: For use with terminal code 23 only.

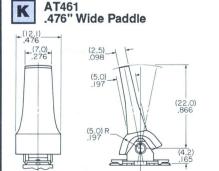




# **ROCKERS & PADDLES** Used with TX code only AT4148 .365" Wide Rocker D (9.27) Nylon **AT**4149 E .365" Wide Paddle (9.27) (8.4) R Nylon AT4150 .453" Wide Rocker Nylon AT4151 .453" Wide Paddle G









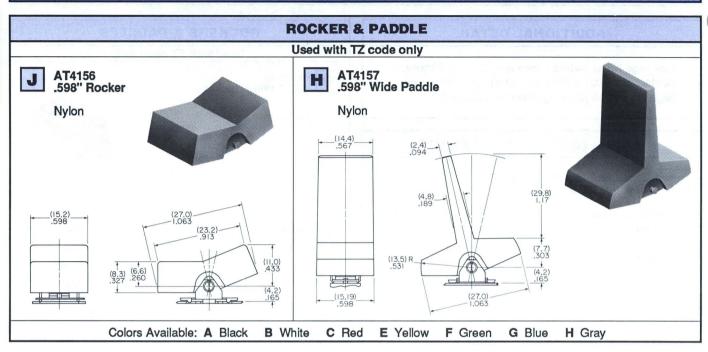
Polycarbonate

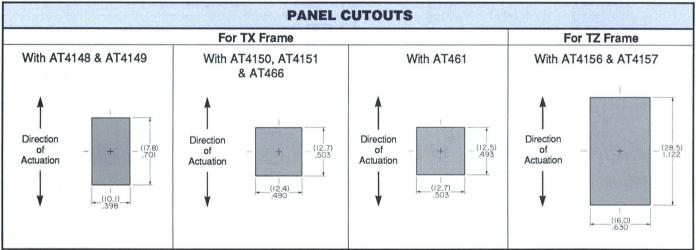
A Black C Red Colors Available: **B** White E Yellow F Green G Blue

N9

# **NKK** SERIES M2 ROCKER SWITCHES

## SUBMINIATURE/WASHABLE/PCB MOUNTING





#### **PCB MOUNTING**

Soldering Time & Temperature Limitations:

3 seconds @ 350°C or

5 seconds @ 270°C.

Alcohol based cleaning solutions are recommended.

#### LEGENDS

Several methods of placing legends on the face of the rocker are available. The preferred method is pad printing due to the increased legend life. Hot stamping and engraving are also available. Details regarding these methods may be obtained from

the

factory.

#### UL & CSA

#### UL File No. E44145:

Models rated 6A @ 125V AC, 3A @ 250V AC, 4A @ 30V DC, and 0.4VA @ 28V AC/DC are recognized by Underwriters Laboratories Inc.

# CSA File Nos. LR23535 and LR56017:

Models rated 6A @ 125V AC, 3A @ 250V AC, and 4A @ 30V DC are certified by Canadian Standards Association.

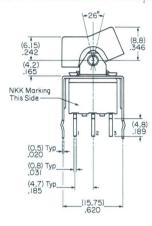
# **NKK**®

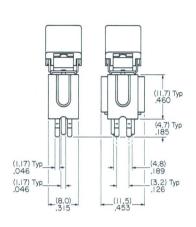
# **SERIES M2 ROCKER SWITCHES**

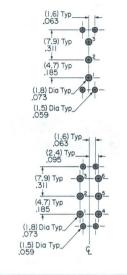
## SUBMINIATURE/WASHABLE/PCB MOUNTING









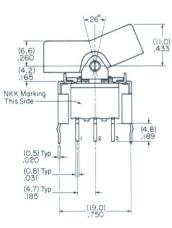


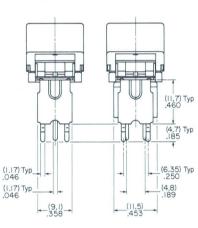
M2T12TXG13-DC Model Shown

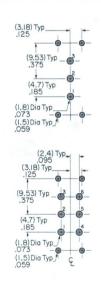
Actuator in DOWN position.

# 23 Large Rocker/Straight PC Terminals with Crimped Bracket/Single & Double Pole







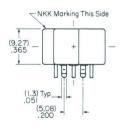


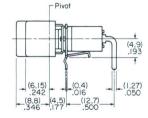
M2T22TZG23-JC Model Shown

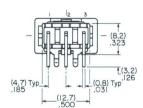
Actuator in DOWN position.

# Small Rocker/Right Angle PC Terminals/Single Pole











M2T12TXG30-DC Model Shown

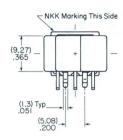
Actuator in DOWN position.

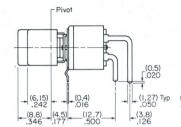
# **NKK** SERIES M2 ROCKER SWITCHES

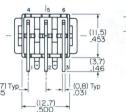
# SUBMINIATURE/WASHABLE/PCB MOUNTING

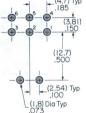










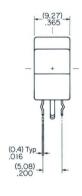


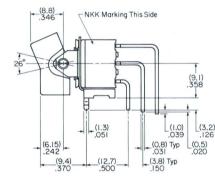
M2T22TXG30-DC Model Shown

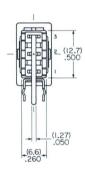
Actuator in DOWN position.

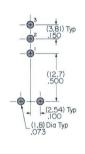
41 Small Rocker/Vertical PC Terminals/Single Pole









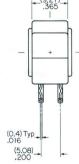


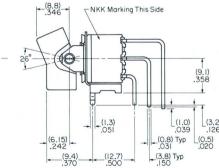
M2T12TXG41-DC Model Shown

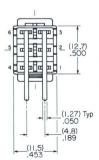
Actuator in DOWN position.

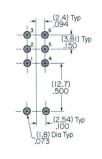
## Small Rocker/Vertical PC Terminals/Double Pole











M2T22TXG41-DC Model Shown

Actuator in DOWN position.

# **NKK** SERIES M2 PUSHBUTTON SWITCHES

## SUBMINIATURE/SNAP ACTION/WASHABLE/PCB MOUNT

## **GENERAL SPECIFICATIONS**

#### For Silver Contacts

Electrical Capacity: (Resistive Load)

1A @ 125V AC 1A @ 30V DC

**Contact Resistance:** 

20 milliohms maximum

Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts
1,500V AC min. between contacts & case

Mechanical Life:

200,000 operations minimum

Electrical Life:

25,000 operations minimum

**Total Travel:** 

1.0mm (.039")

**Ambient Temp Range:** 

-25°C through +70°C (-13°F through +158°F)

#### For Gold Contacts

0.4VA max. @ 28V AC/DC max. (Applicable Range: 0.1mA ~ 0.1A @ 20mV ~ 28V)

30 milliohms maximum

1,000 megohms minimum @ 500V DC

1,000V AC minimum between contacts
1,500V AC min. between contacts & case

200,000 operations minimum

100,000 operations minimum

1.0mm (.039")

MATERIALS & FINISHES			
Plunger	Brass with nickel plating		
Bushing/Housing Fiberglass reinforced polyamide			
Sealing Ring	Nitrile butadiene rubber		
Base	Fiberglass reinforced polyamide		
Movable Contacts	Copper or brass w/gold over nickel (logic level); silver alloy w/silver plating (power)		
Stationary Contacts	Copper or brass w/gold over nickel (logic level); silver alloy w/silver plating (power)		
Terminals	Brass with silver or gold plating		

#### UL & CSA

#### UL File No. E44145:

Models rated 1A @ 125V AC, 1A @ 30V DC, and 0.4VA @ 28V AC/DC are recognized by Underwriters Laboratories Inc.

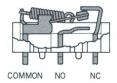
# CSA File Nos. LR23535 and LR56017:

Models rated 1A @ 125V AC, 1A @ 30V DC, and 0.4VA @ 28V AC/DC are certified by Canadian Standards Association.

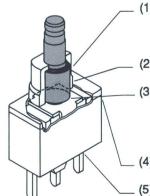
#### **SNAP-ACTING CONTACTS**

The snap-acting contact mechanism in these devices gives the M2 pushbuttons short travel, sensitive actuation, light touch, smooth feel, audible feedback, and longer electrical life.

The contact mechanism is double throw with a normally closed and a normally open contact.



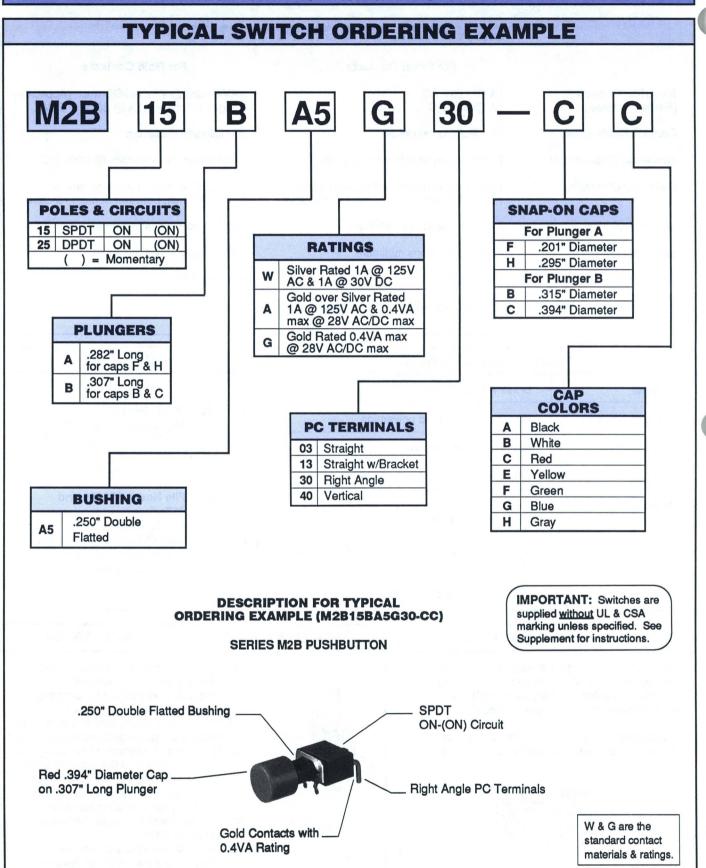
#### **WASHABILITY & ANTIJAMMING DESIGN**



- The interior bushing area is sealed with an o-ring which surrounds the plunger.
   (The switch should not be actuated during any washing process.)
- (2) An exterior bushing seal is achieved by molding a 1-piece bushing/housing top.
- (3) The step at the bottom of the plunger & a plate at the top of the housing resist downward movement of the plunger beyond the total travel distance, thus protecting the contact mechanism.
- (4) Ultrasonic welding seals the bushing unit to the base.
- (5) Terminals are epoxy sealed for safeguarding the switch at the base.

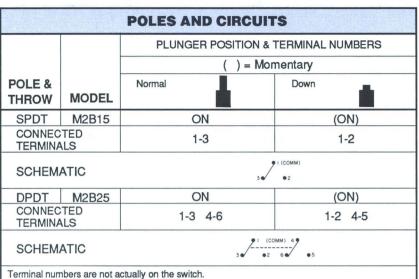


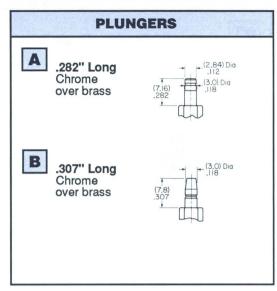
# **NKK** SERIES M2 PUSHBUTTON SWITCHES

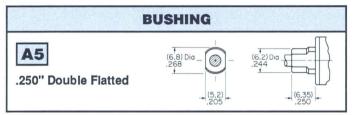


# KK SERIES M2 PUSHBUTTON SWITCHES

# URE/SNAP ACTION/WASHAB







#### **MOUNTING CONSIDERATIONS**

Soldering Time & Temperature Limits 3 seconds @ 350°C 5 seconds @ 270°C

Alcohol based cleaning solutions are recommended.

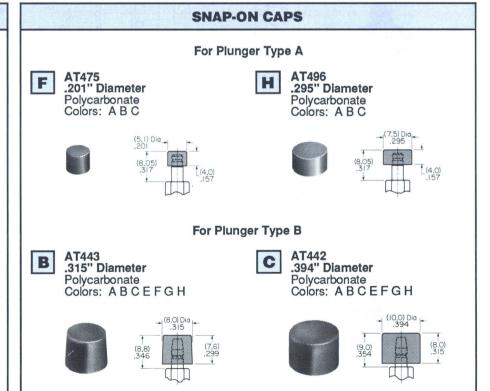


W

Silver over Silver 1A @ 125V AC & 1A @ 30V DC

A Gold over Silver 1A @ 125V AC & 0.4VA maximum @ 28V AC/DC maximum

G Gold 0.4VA maximum @ 28V AC/DC maximum



Color Codes: A Black B White C Red E Yellow F Green G Blue

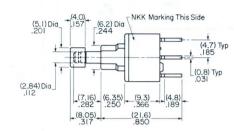
H Gray

# **NKK** SERIES M2 PUSHBUTTON SWITCHES











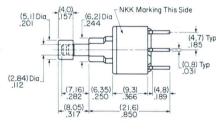


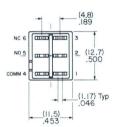
M2B15AA5G03-FC Model Shown

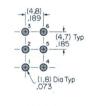
03 Straight PC Terminals/Double Pole







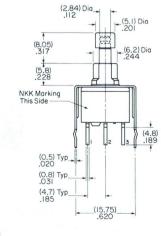


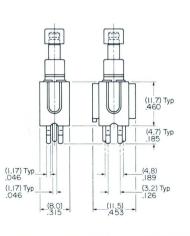


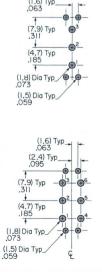
M2B25AA5G03-FC Model Shown

13 Straight PC Terminals with Bracket/Single & Double Pole









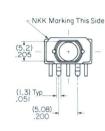
M2B25AA5G13-FC Model Shown

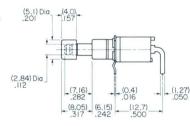
# **NKK** SERIES M2 PUSHBUTTON SWITCHES

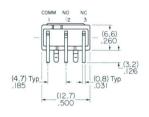
## SUBMINIATURE/SNAP ACTION/WASHABLE/PCB MOUNT

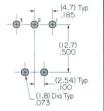








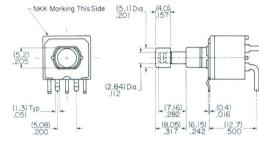


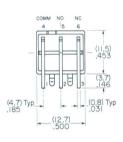


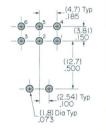
M2B15AA5G30-FC Model Shown

Right Angle PC Terminals/Double Pole





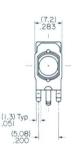


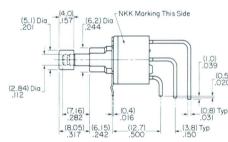


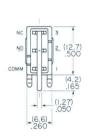
M2B25AA5G30-FC Model Shown

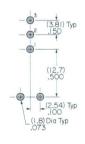
Vertical PC Terminals/Single Pole







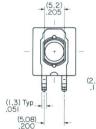


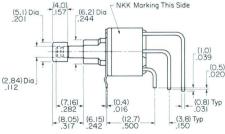


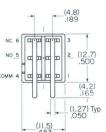
M2B15AA5G40-FC Model Shown

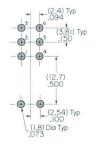
Vertical PC Terminals/Double Pole











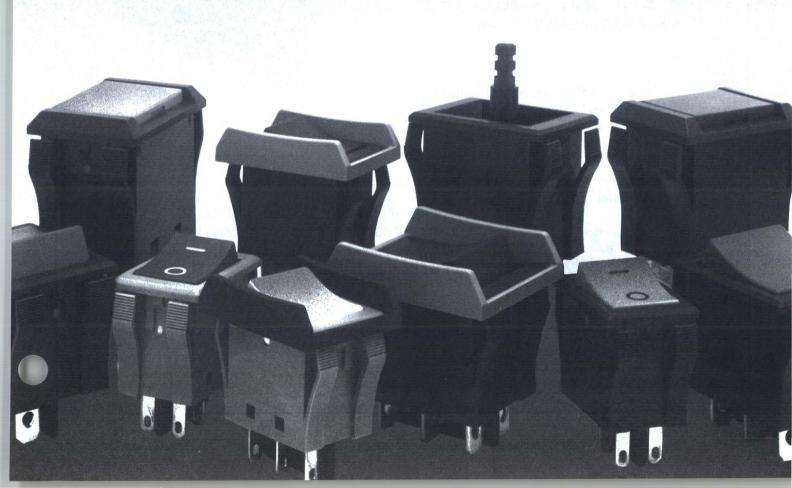
M2B25AA5G40-FC Model Shown

NOTES

# SERIES JW & JP

# TV RATED SWITCHES

ROCKERS • PUSHBUTTONS



# NKK SERIES JW & JP

# TV-RATED/SNAP-IN MOUNT/ROCKERS & PUSHBUTTONS

## **DISTINCTIVE FEATURES**

Industry's first molded rocker and pushbutton with TV rating. Designed to handle large inrush current: M models qualify for TV-5 rating and L models for TV-8 rating.

Special actuator block design for \_ breaking light contact welds.

Constructed for dust resistance with interior seal between actuator and contact area, as well as epoxy sealed terminals.

Outer case of heat resistant resin meets UL's 94V-0 flammability standard.

Prominent external insulating barriers increase insulation resistance and dielectric strength.



Combination solder lug and .110" or .187" \_ quick connect terminals are molded in and epoxy sealed to lock out flux, dust, and other contaminants.

International approvals (UL, CSA, and VDE).



# SERIES JW & JP SWITCHES

## TV-RATED/SNAP-IN MOUNT/ROCKERS & PUSHBUTTONS

### **APPLICATIONS**

JW rockers are designed for applications where a high inrush current occurs but routine usage does not require high current. They are an ideal power source switch where a TV rating is required.

These switches are suited for use in audio and video equipment, factory automation equipment, word processors, copiers, and fax machines.



#### **TV RATINGS**

As required of TV ratings for UL and CSA, the JW & JP switches are capable of handling the initial high inrush characteristics of a tungsten filament lamp load on AC or DC voltage.

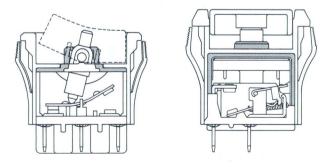
The table below shows the specifications met for both overload and endurance tests at 120V AC:

		Overload Test		Endura	nce Test
		Steady	Minimum	Steady	Minimum
		State	Inrush	State	Inrush
Switch	TV	Current	Current	Current	Current
Model	Rating	(rms)	(peak)	(rms)	(peak)
JW-M	5	7.5A	111A	5A	78A
JP-M	5	7.5A	111A	5A	78A
JW-L	8	12.0A	163A	8A	117A
JP-L	8	12.0A	163A	8A	117A

Overload test is made for 50 operations. Endurance test is made for 25,000 operations.

#### **DUSTPROOF CONSTRUCTION**

**Interior seal** of polyphenylene sulfide (PPS) to prevent intrusion of dust and other particles.



Epoxy sealed terminals also prevent intrusion of contaminants.

NKK® Switches

# **NKK® SERIES JW & JP SWITCHES**

## TV-RATED/SNAP-IN MOUNT/ROCKERS & PUSHBUTTONS

## **GENERAL SPECIFICATIONS**

#### **JW Rockers**

M models: 10A @ 125/250V AC L models: 16A @ 125/250V AC

Contact Resistance: 20 milliohms maximum for JWL 10 milliohms maximum for JWM

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 2,000V AC minimum between contacts

4,000V AC min. between contacts & case

Mechanical Life: 25,000 operations minimum

Electrical Life: 25,000 operations minimum

Ambient Temp. Range: -25°C through +70°C (-13°F ~ +158°F)

Angle of Throw: 26°

**Electrical Capacity:** 

(Resistive Load)

Pretravel: 1.5mm (.059")

Overtravel: 1.8mm (.071")

Total Travel: 3.3mm (.130")

Nominal Operating Force: Single Pole

Single Pole Double Pole Single Pole
JWM 340 grams 720 grams JPM 360 grams
JWL 360 grams 690 grams JPL 460 grams

MATERIALS & FINISHES				
Housing/Frame	Polyamide (UL 94V-0 for JWL & JP)			
Barrier	Polyamide			
Interior Seal	Polyphenylene sulfide			
Movable Contacts	Silver alloy with silver plating			
Stationary Contacts	Silver alloy with silver plating			
Case/Base	Phenolic resin (UL 94V-0 for JWL & JP)			
Terminals	Brass with silver plating			

# 

JP Pushbuttons

20 milliohms maximum for JPL & JPM

1,000 megohms minimum @ 500V DC

2.000V AC minimum between contacts

-10°C through +70°C (+14°F ~ +158°F)

Double Pole

660 grams

920 grams

4,000V AC min. between contacts & case

M models: 10A @ 125/250V AC

L models: 16A @ 125/250V AC

25,000 operations minimum

25,000 operations minimum

#### INTERNATIONAL APPROVALS

UL: File # 44145

CSA: File #s LR23535 & LR56017

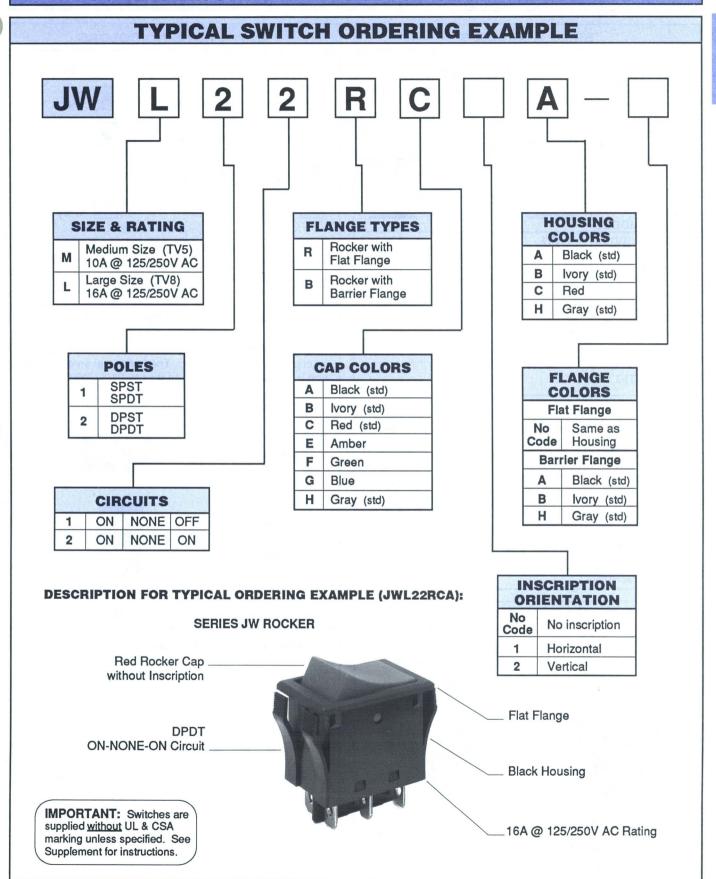
Underwriters Laboratories Inc. recognizes JWL at 16A @ 250V AC & JWM at 10A @ 250V AC.

Canadian Standards Association certifies JWL at 16A @ 250V AC & JWM at 10A @ 250V AC. VDE: File #s 62493 for JWL & 57920 for JWM

Verband Deutscher Elektrotechniker of West Germany approves JW models at the following ratings: JWL ~ steady state 8A, inrush 128A, resistive 16A, & motor load 10A all at 250V AC; JWM ~ steady state 5A, inrush 80A, resistive 10A, & motor load 6A all at 250V AC.

# **NKK** SERIES JW ROCKER SWITCHES

## TV-RATED/SNAP-IN MOUNT/MOLDED ROCKER



# **NKK** SERIES JW ROCKER SWITCHES

# V-RATED/SNAP-IN MOUNT/MOLDED ROCKER

#### **SIZES & RATINGS**

**Medium Size** M 10A @ 125/250V AC TV5 rated

Large Size 16A @ 125/250V AC TV8 rated

POLES AND CIRCUITS				
		ROCKER POS	TION & TERMINAL NUMBERS	
		D	( ) = Momentai	,
BOLE 0		Down	Center	Up
POLE & THROW	MODEL			
SPST	JW11	ON	NONE	OFF
CONNEC		1-1b	OPEN	OPEN
SCHEM	MATIC	●I (COMM) ●Ib		
SPDT	JW12	ON	NONE	ON
CONNECTED TERMINALS		1-1b	OPEN	1-1a
SCHEMATIC		1 (COMM)		
DPST JW21		ON	NONE	OFF
CONNECTED TERMINALS		1-1b 2-2b	OPEN	OPEN
SCHEMATIC     COMM   29   O   O   O   O   O   O   O   O   O				
DPDT	JW22	ON	NONE	ON
CONNECTED TERMINALS		1-1b 2-2b	OPEN	1-1a 2-2a
SCHEMATIC (COMM) 29  • Ib 20  • 2b			)	

Terminal numbers are on the switch. Actuator positions oriented with switch part number facing front.

#### **CAP & HOUSING COLORS**

Cap Colors:

**Housing Colors:** 

Black \*

Black \*

Blue

Ivorv \*

Red

E Yellow

Grav \*

\* indicates standard color.

Cap Material: Polyphenelene oxide Finish: Matte Housing/Flange Material: Polyamide Finish: Matte

#### **INSCRIPTION ORIENTATION**

The international symbols for on-off are shown in the inscription examples below. The horizontal on-off inscription is standard on DPST models JWL21 & JWM21.

No Code

No Inscription

1

Inscription for Horizontal Mounting



2

Inscription for Vertical Mounting



#### **FLANGE TYPES**

Rocker with Flat Flange R



Flat Flange type R is a molded, integral part of the switch housing. Black, ivory, & gray standard.

Rocker with **Barrier Flange** 



Barrier Flange type B designates that either barrier AT217 or AT218 is factory assembled. See Accessories section.

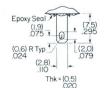
#### **SOLDERING & WIRING**

Soldering Time & Temperature: 3 seconds @ 350°C

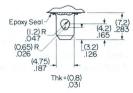
Wiring for JWM: .047" x .079" terminal hole accommodates 1 solid 18-gg wire or 2 solid or stranded 20-gg wires.

Wiring for JWL: the pear-shaped .094" dia./.052" dia. terminal hole accommodates 1 solid or stranded 12-gg wire or 2 solid or stranded 18-gg wires.

#### For JWM Rockers



#### For JWL Rockers



# **NKK** SERIES JW ROCKER SWITCHES

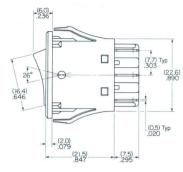
## TV-RATED/SNAP-IN MOUNT/MOLDED ROCKER

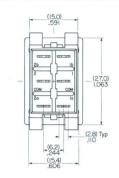










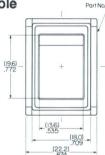


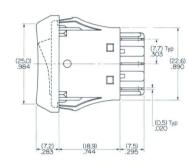
Single pole models do not have terminals 2a, 2, & 2b; single throw models also do not have 1a & 2a.

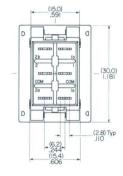
B Barrier Flange 1 & 2 Pole Medium Size 10 Amp



JWM22BAA-H Model Shown





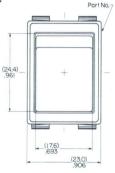


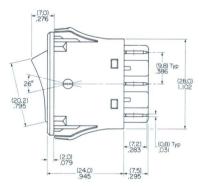
Single pole models do not have terminals 2a, 2, & 2b; single throw models also do not have 1a & 2a.

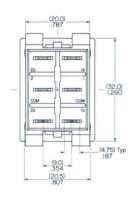
Flat Flange 1 & 2 Pole Large Size 16 Amp



JWL22RCA Model Shown





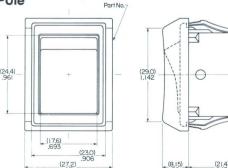


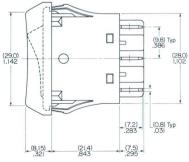
Single pole models do not have terminals 2a, 2, & 2b; single throw models also do not have 1a & 2a.

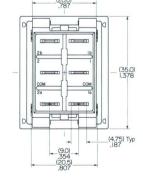
B Barrier Flange 1 & 2 Pole Large Size 16 Amp



JWL12BCA-H Model Shown





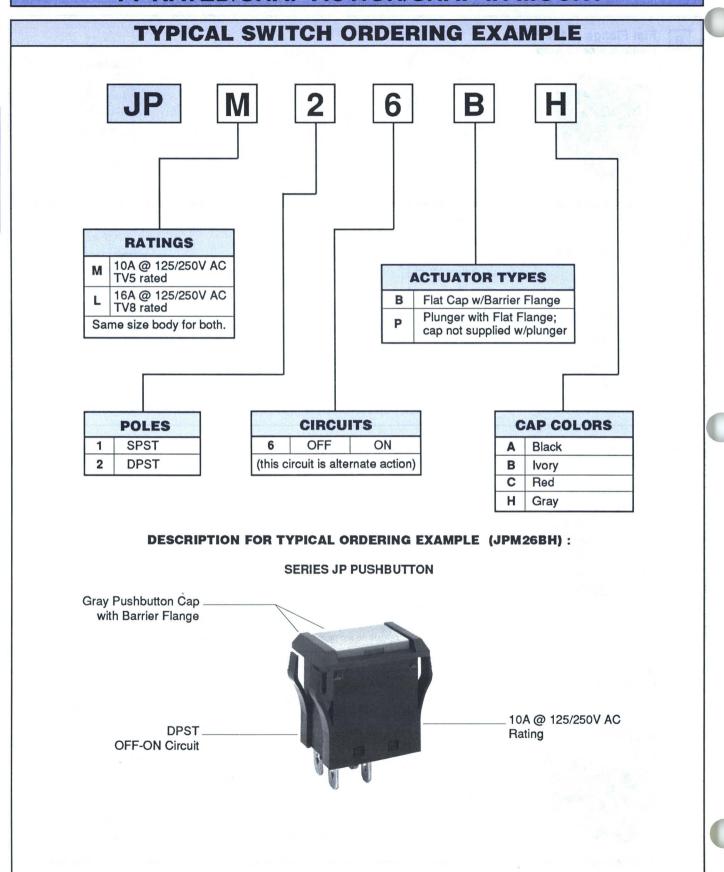


Single pole models do not have terminals 2a, 2, & 2b; single throw models also do not have 1a & 2a.



# **NKK** SERIES JP PUSHBUTTON SWITCHES

## V-RATED/SNAP ACTION/SNAP-IN MOUNT



# DKK®

# **SERIES JP PUSHBUTTON SWITCHES**

## TV-RATED/SNAP ACTION/SNAP-IN MOUNT

#### RATINGS

M

10A @ 125/250V AC TV5 rated



16A @ 125/250V AC TV8 rated

POLES AND CIRCUITS				
		PLUNGER POSITION 8	TERMINAL NUMBERS	
		Normal	Down	
POLE & THROW	MODEL	-		
SPST	JP16	OFF ON		
CONNECTED TERMINALS		OPEN	1-1a	
SCHEMATIC / •Io				
DPST	JP26	OFF ON		
CONNECTED TERMINALS		OPEN	1-1a 2-2a	
SCHEMATIC (COMM) 29				

#### **ACTUATOR TYPES**



Flat Cap with Barrier Flange

(cap details below)

Body & barrier are black with matte finish.





Plunger with Flat Flange

(no cap supplied for plunger type actuator)

Body & barrier are black with matte finish.



#### **CUTOUT & PANEL THICKNESS RANGE**

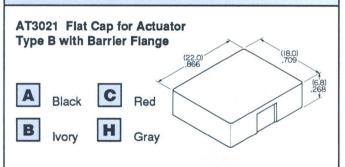


Terminal numbers are on the switch.

Panel Thickness Range applies to both JPM & JPL models.

> 1.0 ~ 4.0mm (.039" ~ .157")

#### **CAP COLORS**

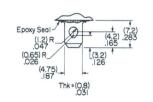


Cap Material: Polyphenelene oxide Cap Finish: Matte

#### **SOLDERING & WIRING**

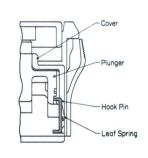
JPM Model & JPL Model

The pear-shaped .094" dia./.052" dia. terminal hole accommodates 1 solid or stranded 12-gauge wire or 2 solid or stranded 18-gauge wires.



Soldering: 3 seconds at 350°C

#### **LATCHDOWN MECHANISM**



The latchdown feature on this alternate action device provides visible, audible, and tactile feedback. This design gives smooth, responsive operation.

The cap is flush with the barrier in normal position and 2.0mm (.079") below that in latchdown position.

# **NKK** SERIES JP PUSHBUTTON SWITCHES

# TV-RATED/SNAP ACTION/SNAP-IN MOUNT

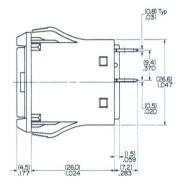


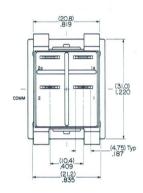
B

Flat Cap with Barrier Flange JPM & JPL Models Single & Double Pole

JPM26BH Model Shown







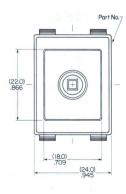
Single pole model does not have terminals 2 & 2a.

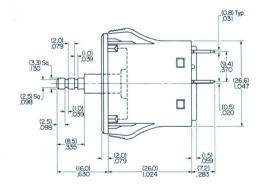


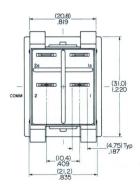
P

Plunger with Flat Flange JPM & JPL Models Single & Double Pole

JPL16P Model Shown



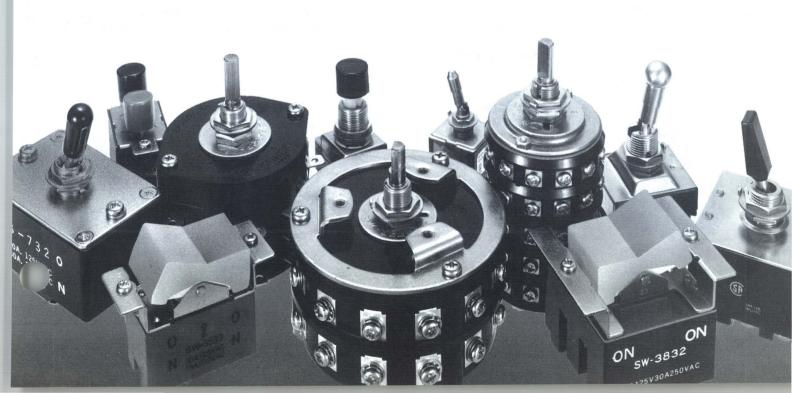




Single pole model does not have terminals 2 & 2a.

# STANDARD & HIGH CAPACITY SWITCHES

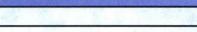
- TOGGLES ROCKERS
- PUSHBUTTONS ROTARIES



# **DKK®**

# STANDARD &

TOGGLES/ROCKERS/





P2022 Model Shown

#### P TOGGLE & ROCKER STANDARD SIZE

1 & 2 pole with 3 maintained circuits **Electrical Capacity:** Resistive Load - 10A @ 125V AC & 6A @ 250V AC Inductive Load - 6A @ 125/250V AC Motor Load - 400W @ 125V AC Lamp Load -2-3A @ 125V AC Bushing mount with 6mm or 12mm diameter bushings for toggles Subpanel & flat frame mount for rockers Solder lug, straight PC, & .187" quick connect terminals UL, CSA, VDE, SEV, SEMKO, JETL Pages S4-S6



S832D Model Shown

#### S & SW TOGGLE & ROCKER HIGH CAPACITY AC/DC

2 & 3 pole with 3 maintained circuits
Electrical Capacity:
Resistive Load - 15 through 30A @ 125V AC or 15A @ 125V DC
Inductive Load - 30A @ 125V AC or 5A @ 125V DC
Bushing mount for toggles or subpanel mount for rockers
Screw terminals

Pages S16-S18, S22-S23



S1A Model Shown

#### S TOGGLE STANDARD SIZE

1 through 4 pole with 6 circuits
Electrical Capacity:
Resistive Load - 3 through
25A @ 125V AC
Bushing mount --splashproof bushing
available
Solder lug, screw, &
quick connect terminals
Pages S7-S15



SW3116 Model Shown

#### **SW ROCKER** STANDARD SIZE

1 & 2 pole with 4 circuits
Electrical Capacity:
Resistive Load - 3A through
20A @ 125V AC
Subpanel mount
Solder lug terminals
Pages S20-S21



S821 Model Shown

# S TOGGLE HIGH CAPACITY

2 & 3 pole with 3 maintained circuits
Electrical Capacity:
Resistive Load - 30A @
125V AC for S800 & S500 models; 50A @ 125V AC for S700 models
Bushing mount
Screw terminals
Pages S16-S19



SW3822 Model Shown

#### **SW ROCKER** HIGH CAPACITY

2 & 3 pole with 3 maintained circuits
Electrical Capacity:
Resistive Load - 30A @ 125V AC
Subpanel mount
Screw terminals

Pages S22-S23



# HIGH CAPACITY

# PUSHBUTTONS/ROTARIES



SB285 Model Shown

### **SB PUSHBUTTON** STANDARD SIZE

1 & 2 pole with momentary or alternate action circuits Electrical Capacity: Resistive Load - 3 through 15A @ 125V AC Bushing mount Solder lug & screw terminals Pages S24-S26



TS2 Model Shown

### **TS ROTARY** STANDARD SIZE

1 through 5 pole with 2 through 11 positions Nonshorting Electrical Capacity: Resistive Load -6A @ 125/250V AC Bushing mount with 10mm diameter bushing Flatted shafts Screw terminals

Pages S35-S37



SDB222 Model Shown

# **SDB PUSHBUTTON** STANDARD SIZE

2 pole ON-ON circuit **Electrical Capacity:** Resistive Load - 15A@ 125V AC or 10A @ 250V AC Flush panel, subpanel, & snap-in mounting Solder lug terminals Round & square caps of four different colors Pages S27-S28

**SCB PUSHBUTTON** 

STANDARD SIZE

1 & 2 pole with momentary

Resistive Load - 10-15A

12 mm diameter bushing

Solder lug, screw, and .250"

quick connect terminals

Rectangular or round caps

for attractive front panel

& shrouds in various colors

Pages S29-S31

Inductive Load - 10A

Bushing mount with

or alternate action

**Electrical Capacity:** 

@ 125V AC

@ 125V AC

appearance







PS2-N Model Shown

# **HS ROTARY** STANDARD SIZE

1 through 6 pole with 2 through 11 positions Shorting or nonshorting Electrical Capacity: Resistive Load -6A @ 125V AC for HS 13; 12A @125V AC for HS 16 Bushing mount with 10mm diameter bushing Round smooth, round knurled, or flatted shafts Solder lug/.250" quick connect terminals Pages S32-S33, S36-S37

# **PS ROTARY** HIGH CAPACITY

1 through 5 pole with 2 through 11 positions Nonshorting Electrical Capacity: Resistive Load - 30A @ 125/250V AC Bushing mount with 10mm diameter bushing Round knurled or flatted shafts Screw terminals Pages S34.

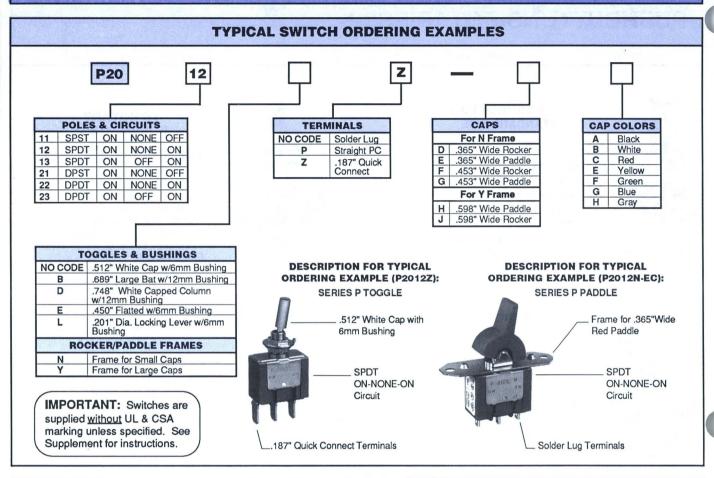
S36-S37



SCB25P10A-4CA Model Shown

# **NKK** SERIES P TOGGLES & ROCKERS

# **ANDARD SIZE/1-2 POLE/BUSHING & SUBPANEL MOUNT**



### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

**Resistive Load Inductive Load**  10A @ 125V AC or 6A @ 250V AC 6A @ 125/250V AC for UL Recognition

400W @ 125V AC

**Motor Load** Lamp Load

2A @ 125V AC for ON-OFF-ON circuits

3A @ 125V AC for other circuits 10 milliohms maximum

**Contact Resistance:** Insulation Resistance:

1,000 megohms minimum @ 500V DC

**Dielectric Strength:** 

**Electrical Life:** 

2,000V AC minimum between contacts 4,000V AC minimum between contacts and case

**Mechanical Life:** 100,000 operations minimum for toggles

50,000 operations minimum for paddles & rockers 25,000 operations minimum

**Ambient Temp Range:** 

- 10°C through +70°C (+14°F through +158°F)

Angle of Throw:

# INTERNATIONAL RECOGNITION, APPROVAL, ETC.

E44145

10A @ 125V AC & 6A @ 250V AC Rating 1 & 2 Pole Models Solder Lug, PC, & Quick Connect Terminals All Toggle Options

CSA LR23535 & LR56017

10A @ 125V AC & 6A @ 250V AC Rating 1 & 2 Pole Models All Circuits Solder Lug, PC, & Quick Connect Terminals All Toggle Options

**SEMKO:** 8438164 for P2021, 2022, 2023; 8524080 for P2011, 2012; and 8525184 for P2013 **SEV:** 79.13166.01 **VDE:** 33306 **JETL** for P2013 10A @ 125V AC & 6A @ 250V AC Rating Solder Lug, PC, & Quick Connect Terminals All Toggle Options

			LE POSITIO! MINAL NUME	
POLE & THROW	MODEL	Down	Center	Up
SPST	P2011	ON	NONE	OFF
CONNECTE	ED S	1-1b	OPEN	OPEN
SCHEMATI	С	1	(COMM)	
SPDT	P2012 P2013	ON ON	NONE OFF	ON ON
CONNECTE		1-1b	OPEN	1-1a
SCHEMATI	С	la 🗸	(COMM) ●Ib	
DPST	P2021	ON	NONE	OFF
CONNECTE		1-1b 2-2b	OPEN	OPEN
SCHEMATI	С	•1b	1M) 29 •2b	
DPDT	P2022 P2023	ON ON	NONE OFF	ON ON
CONNECTE		1-1b 2-2b	OPEN	1-1a 2-2a
SCHEMATI	С	la • Ib 2	/	
Terminal nu	ımbers are o	n the switch.		

POLES & CIRCUITS

# **NKK** SERIES P TOGGLES & ROCKERS

# TOGGLES WITH BUSHINGS AND ROCKER/PADDLE FRAMES

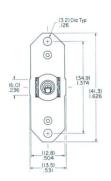


.512" White Cap



Cap AT406

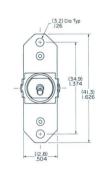




Frame for

Small Actuator

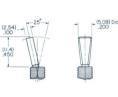
Frame for Y Large Actuator



.748" White D Capped Column w/12mm Bushing



.450" Flatted w/6mm Bushing E



.201" Dia. Locking Lever w/6mm Bushing



Cap AT427

# **TERMINALS**

NO CODE

Solder Lug

Soldering Limits: 3 sec at 350°C: 5 sec at 270°C Wiring: .049" X .079" holes accommodate 1 solid or stranded 18-gg wire or 2 solid or stranded 20-gg wires.



Straight PC



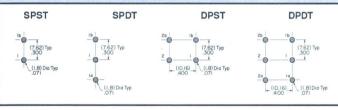
Z

.187" Quick Connect

Matching receptacles available from AMP, Hollingsworth, and other manufacturers.



PC BOARD MOUNTING



# **HARDWARE & HARDWARE KITS**

Standard Hardware

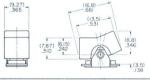
For 6mm Bushing: 1 AT507, 1 AT509, & 2 AT513 For 12mm Bushing 1 AT503, 1 AT506, 1 AT508, & 1 AT527

Hardware Kits

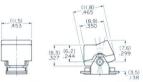
Kit HK-1 for N Frame & Kit HK-2 for Y Frame; Kits include: 2 each stainless steel screws, nuts, & lockwashers & 2 aluminum or nylon standoffs; details in M Series rocker section for TN & TY frames.

### **ROCKER/PADDLE CAPS**

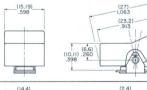




F AT4150 .453" Wide Rocker for N Frame

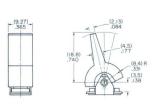


J AT4156 .598" Wide Rocker for Y Frame

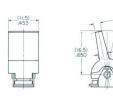


E

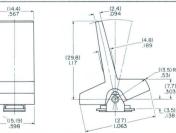
AT4149 .365" Wide Paddle for N Frame



G AT4151 .453" Wide Paddle for N Frame



H AT4157 .598" Wide Paddle for Y Frame



Material: Nylon

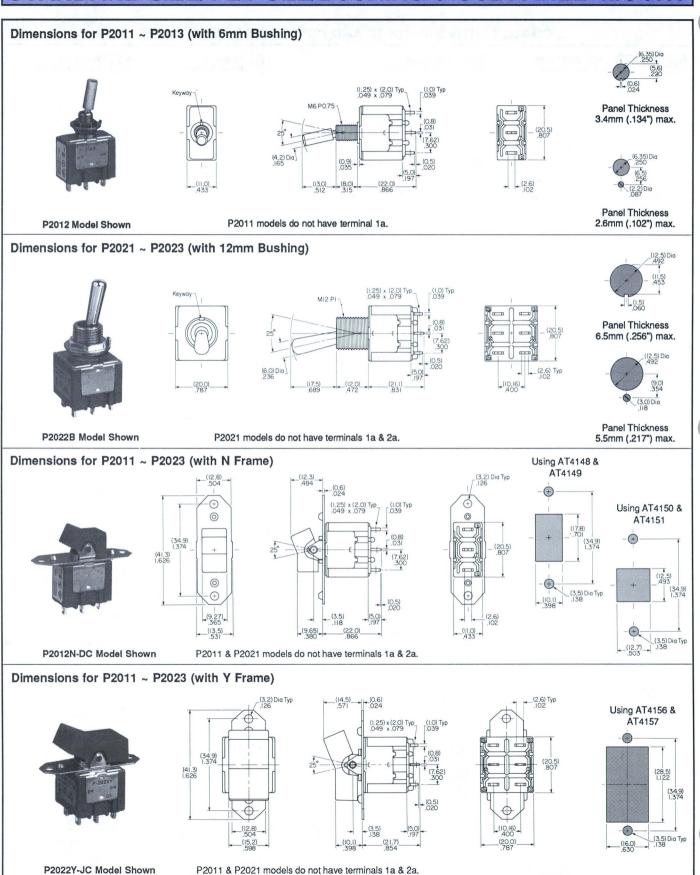
Colors Available: A Black B White C Red E Yellow F Green G Blue H Gray

(14.5)

# **PKK**®

# **SERIES P TOGGLES & ROCKERS**

# STANDARD SIZE/1-2 POLE/BUSHING & SUBPANEL MOUNT



# LOW CAPACITY/1 & 2 POLE/BUSHING MOUNT

			LE POSITION		ELE	ECTRICA	L CAP	ACITY	TE	RMINA	LS	т	OGGLES	3
		Down	Center	Up		Resistive		Inductive						Fluo-
POLE & THROW	MODEL	Keywey			AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Solder Lug	Screw	Quick Connect	Bat	Plastic Paddle	res- cent Tip Paddle
SPST	S211 S211T	ON ON	NONE NONE	OFF OFF	3A 3A	1.5A 1.5A	1.5A 1.5A	1.5A 1.5A	X 	 X		X		
CONNEC		1-2	OPEN	OPEN			,	SCHEMATION	D:		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -			
SPDT	S4012	ON	NONE	ON	6A		4A		Х			Х		
CONNEC TERMINA		2-3	OPEN	2-1			;	SCHEMATIC	D:		92 (COMM) •3			
DPST	S114	ON	NONE	OFF	5A		5A	зА	X			Х		
CONNEC		2-1 5-4	OPEN	OPEN			;	SCHEMATIC	D:	10/	92 (COMM) 5	,		-
DPDT	S116 S116R S116RN	ON ON ON	NONE NONE NONE	ON ON ON	5A 5A 5A	2A 2A 2A	5A 5A 5A	3A 3A 3A	X X X			X 	X	 X
CONNEC		2-1 5-4	OPEN	2-3 5-6			:	SCHEMATIC	D:	1.	2 (COMM) 59	•6		

### **GENERAL SPECIFICATIONS**

Contact Resistance:

10 milliohms maximum

Insulation Resistance:

200 megohms minimum @ 500V DC for S200s, 100s, & 4012

**Dielectric Strength:** 

1,000V AC minimum for S4012 1,500V AC minimum for S200s & 100s

Mechanical Life:

30,000 operations minimum for S200s, 100s & 4012

Electrical Life:

10,000 operations minimum for S200s, 100s & 4012

**Ambient Temp Range:** 

-10°C through +70°C (+14°F through +158°F)

Angle of Throw:

25° for S100s 36° for S200s 18° for S4012

# **PLASTIC PADDLES**

R

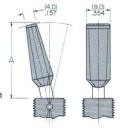
**Flatted Lever** 

RN

**Flatted Fluorescent** Tip Lever

Material: ABS Resin Color: Black Only Dimension A:

29.0mm (1.142")



### **TERMINAL DETAILS FOR ALL S SERIES TOGGLES**

### No Code

Solder Lug

### **SOLDERING TEMPERATURE LIMITS**

3 seconds at 350°C 5 seconds at 270°C

### WIDING SPECIFICATIONS

44	INING SPECIFICA	TIONS
Series	Hole Diameter	Solid or Stranded
S114,116	2.0mm/.079"	1 14-gauge
S300s	3.2mm/.126"	1 10-gauge
S330s & all others	2.4mm/.094"	1 12-gauge
S4012	1.1 X 2mm/	2 20-gauge

.043 X .079"

# T

(Terminal hardware supplied)





# **SCREWS & TERMINAL HARDWARE**

Model	Size	& Description	
S30Ts,40Ts	M3.5 x 5	AT082A	
S200s	M3 x 4	AT082E	
S301T-309T	M3.5 x 5	AT082A w/ lockwasher	
S330s	M3.5 x 5	AT082A	
S400s, 500s	M4 x 5	AT082B w/ lockwasher	
S732	M6 x 8	AT082D w/ locking ring	
	& cup washe	er	
S800s	M4.5 x 6	AT082C w/ locking ring	
S301T-309T S330s S400s, 500s S732	M3.5 x 5 M3.5 x 5 M4 x 5 M6 x 8 & cup washe	AT082A w/ lockwashe AT082A AT082B w/ lockwashe AT082D w/ locking ring er	r

**Quick Connect** 

### Dimension "A"

11mm/.433" (6.35)

Thk = (0.8)

S31-33 S301-302

S28

11.7mm/.461" S1-3 S21 S333

11.8mm/.465" S6-7 S41-43

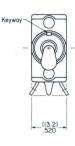
S331-332 S335

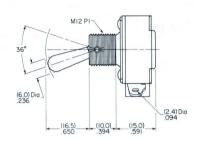
.250" width corresponds to AMP 250 Series receptacles

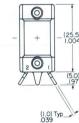
# **LOW CAPACITY/1 & 2 POLE/BUSHING MOUNT**

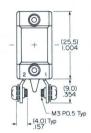
### Dimensions for S211 ~ S211T









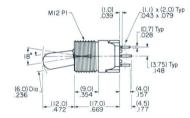


S211 Model Shown

### **Dimensions for S4012**





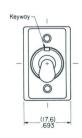


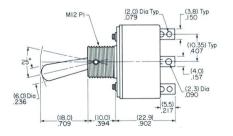


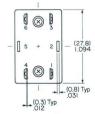
S4012 Model Shown

### Dimensions for S114 ~ S116RN









S116 Model Shown

S114 does not have terminals 3 & 6.



# MEDIUM RATED/STANDARD SIZE/1 & 2 POLE

				POLES,	CIRC	TIU	'S, 8	& RA	TING	S	B , Tref	ase ,	STATE		alida e	emili
			LE POSITION			ELEC.	TRIC	AL CA	PACITY	,	TE	ERMINA	LS	Т	OGGL	.ES
		(	) = Momentary	/	R	esistiv	0	Indu	ctive	Lamp						Splash
POLE & THROW	MODEL	Down Keyway	Center	Up	AC 125V	AC 250V	DC 30V	AC 125V	AC 125V PF 0.6	AC 125V	Solder Lug	Screw	Quick Connect	Bat	Lever Lock	proof Bush- ing
SPST	S1A S1AW S1B S1BW S1F	ON ON ON ON	NONE NONE NONE NONE NONE	OFF OFF OFF OFF	15A 15A 10A 10A 15A	6A 6A 5A 5A 6A	20A 20A 10A 10A 20A	200W  	8A  5A  8A	4A 	X X X		  X	X X X X	 	X  X
CONNEC		1-3	OPEN	OPEN				sc	HEMAT	C:		10/	INTERN CONNEC	CTION		
	S2A S2AW S2B S2BW S2F	ON ON ON ON	NONE NONE NONE NONE NONE	ON ON ON ON	15A 15A 10A 10A 15A	6A 6A 5A 5A 6A	20A 20A 10A 10A 20A	200W	8A  5A  8A	4A 	X X X		  X	X X X		X  X
SPDT	S3A S3AW S3B S3BW S3F	ON ON ON ON	OFF OFF OFF OFF	ON ON ON ON	15A 15A 5A 5A 15A	6A 6A 3A 3A 6A	20A 20A  20A	200W	8A   8A	5A 	X X X		  X	X X X X	 	X X
	S5AW S8AW S9AW	ON (ON) ON	NONE OFF OFF	(ON) (ON) (ON)	15A 15A 15A	6A 6A 6A	20A 20A 20A	200W 200W 200W			X X X		92 (COMM	X X		X X X
CONNEC TERMINA		2-3	OPEN	2-1				SC	HEMAT	C:			1 • 3	,		
DPST	S21A S21AW S21B S21BW S21F	ON ON ON ON	NONE NONE NONE NONE	OFF OFF OFF OFF	15A 15A 10A 10A 15A	15A 15A 5A 5A 15A	15A 15A 10A 10A 15A	200W 	8A  5A  8A	4A 	X X X		  X	X X X X		X  X
CONNEC	TED	1-3 4-6	OPEN	OPEN				SC	HEMATI	C:		3	4. 6	INTERNA	AL TION	
	S6A S6AW S6B S6BW S6F	ON ON ON ON	NONE NONE NONE NONE NONE	ON ON ON ON	20A 20A 10A 10A 20A	10A 10A 5A 5A 10A	20A 20A 10A 10A 20A		8A  5A  8A		X X X		  X	X X X X		X X
DPDT	S7A S7AW S7B S7BW S7F	ON ON ON ON	OFF OFF OFF OFF	ON ON ON ON ON	20A 20A 5A 5A 20A	10A 10A 3A 3A 10A	20A 20A 5A 5A 20A		8A  5A  8A		X X X		  X	X X X		X X
	S25AW S28AW S29AW	ON (ON) ON	NONE OFF OFF	(ON) (ON) (ON)	15A 15A 15A	6A 6A 6A	20A 20A 20A				X X X		X	X X		X X X
CONNEC		2-3 5-6	OPEN	2-1 5-4				SC	HEMATI	C:		1.	92 (COMM) 5	•6		
25-20-20-20-20-20-20-20-20-20-20-20-20-20-		e on the switch.	. √ = lever lock	with panel seal	; order	ing suf	fix is L	; for exa	ample, S	IAL; dra	awing on	page S1			on pag	e S7.

### **GENERAL SPECIFICATIONS**

**Contact Resistance:** 10 milliohms maximum

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 2,000V AC minimum

Mechanical Life: 30,000 operations minimum for S5AW, 8AW, 9AW, 25AW, 28AW, 29AW

50,000 operations minimum for all other models

**Electrical Life:** 25,000 operations minimum

10,000 operations minimum with lamp load

-30°C through +70°C (+22°F through +158°F) for Splashproof models Ambient Temp Range:

-10°C through +70°C (-14°F through +158°F) for all other models

Angle of Throw: a 20° 21° 22° 24° 25°

S28AW

S5AW S6A S6AL S1AL, S2AL S1A/B/F S3AL, S7AL

S6AW/BW S2A/B/F S25AW S<sub>6</sub>B S1AW/BW S3AW/BW S6F S21AW/BW S2AW/BW S3A/B/F S7A/B/F

S8AW, S9AW

S21B S29AW S21AL

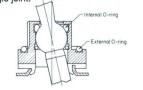
UL & CSA: See Supplement pages for specific models.

S21A

### SPLASHPROOF BUSHING

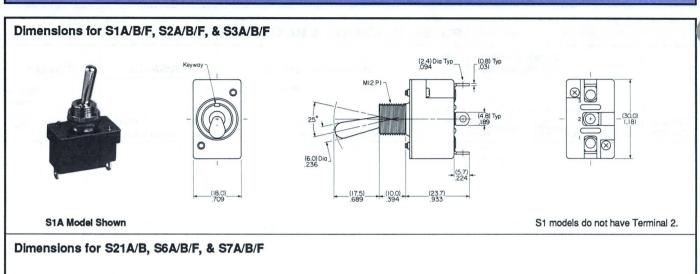
Any model with W in the part W number has a splashproof

bushing that includes two nitrile butadiene rubber seals which protect the contact mechanism: (1) the external o-ring in a trough at the top of the bushing collar and (2) the internal o-ring inside the bushing above the toggle joint.



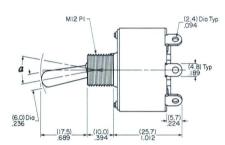
S7AW/BW

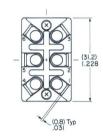
# **MEDIUM RATED/STANDARD SIZE/1 & 2 POLE**











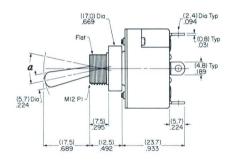
S6A Model Shown

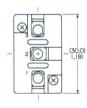
S21 models do not have Terminals 2 & 5.

# Dimensions for S1AW/BW, S2AW/BW, S3AW/BW, S5AW, S8AW, & S9AW









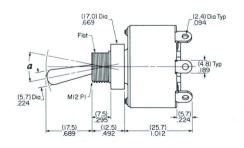
S2AW Model Shown

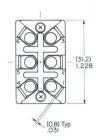
S1 models do not have Terminal 2.

# Dimensions for S21AW/BW, S6AW/BW, S7AW/BW, S25AW, S28AW, & S29AW









**S6AW Model Shown** 

S21 models do not have Terminals 2 & 5.



# **HIGH RATED/STANDARD SIZE/1 & 2 POLE**

				POLES,	CIRCU	JITS, 8	& RAT	rings		(0.6)	18	Birnai	sholer	is much
			SLE POSITIO		ELE	ECTRICA	L CAP	ACITY	Т	ERMINA	ALS		TOGGLE	S
			( ) = Momenta	ry		Resistive		Inductive						Fluo- res-
POLE & THROW	MODEL	Down Keyway	Center	Up	AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Solder Lug	Screw	Quick Connect	Bat	Plastic Paddle	cent Tip Paddle
SPST	S301 S301F S301T	ON ON ON	NONE NONE NONE	OFF OFF OFF	15A 15A 15A	6A 6A 6A	20A 20A 20A	10A 10A 10A	X 	 X	X	X X X		
CONNECTE	ED S	1-3	OPEN	OPEN			SC	HEMATIC:			1 N CC	ITERNAL ONNECTION		
	S302 S302F S302T S303	ON ON ON	NONE NONE NONE	ON ON ON	15A 15A 15A 15A	6A 6A 6A	20A 20A 20A 20A	10A 10A 10A 10A	X  X	 X	X	X X X		
SPDT	S303T S305 S305T	ON ON ON	OFF OFF NONE NONE	ON (ON) (ON)	15A 15A 15A	6A 6A 6A	20A 20A 20A	10A 8A 8A	X	X  X		X X X		
	S308 S308T S309 S309T	(ON) (ON) ON ON	OFF OFF OFF	(ON) (ON) (ON) (ON)	15A 15A 15A 15A	6A 6A 6A	20A 20A 20A 20A	8A 8A 8A 8A	X  X	X  X		X X X		
CONNECTE TERMINALS	ED S	2-3	OPEN	2-1			SC	HEMATIC:				COMM)		
DPST	S331 S331F S331R S331RN S331T	ON ON ON ON	NONE NONE NONE NONE	OFF OFF OFF OFF	25A 25A 25A 25A 15A	25A 25A 25A 25A 15A	25A 25A 25A 25A 15A	10A 10A 10A 10A 10A	X X X	  X	X	X X  X	X	 X
CONNECTE	D S	1-3 4-6	OPEN	OPEN			SC	HEMATIC:		1.	3 4	INTE	RNAL	
	S332 S332F S332R S332RN S332T S333	ON ON ON ON ON	NONE NONE NONE NONE NONE	ON ON ON ON ON	25A 25A 25A 25A 15A 25A	15A 15A 15A 15A 15A 15A	25A 25A 25A 25A 15A 25A	10A 10A 10A 10A 10A	X X X	  X	X	X X  X X	X	X
DPDT	S333F S333R S333RN S333T S335	ON ON ON ON	OFF OFF OFF NONE	ON ON ON ON (ON)	25A 25A 25A 15A	15A 15A 15A 15A 6A	25A 25A 25A 15A 20A	10A 10A 10A 10A 8A	X X 	 X	X 	X  X X	X 	X
	S335F S335T S338 S338R S338RN	ON ON (ON) (ON) (ON)	NONE NONE OFF OFF	(ON) (ON) (ON) (ON) (ON)	15A 15A 15A 15A 15A	6A 6A 6A 6A	20A 20A 20A 20A 20A	8A 8A 8A 8A	X X X	X	X	X X 	X	  X
	S338T S339 S339R S339RN S339T	(ON) ON ON ON ON	OFF OFF OFF OFF	(ON) (ON) (ON) (ON) (ON)	15A 15A 15A 15A 15A	6A 6A 6A 6A	20A 20A 20A 20A 20A	8A 8A 8A 8A 8A	X X X	  X		X  X	X	X
CONNECTE TERMINALS	ED S	2-3 5-6	OPEN	2-1 5-4			SC	CHEMATIC:			2 (COM	M) 59	6	
Terminal r	numbers are	on the switch.	Terminal detai	on page S7. M	lost of the	above m	odels are	UL Recogn	ized or C	SA Cert	tified; see d	etails in	the Suppl	ement.

### **GENERAL SPECIFICATIONS**

Contact Resistance: Insulation Resistance: 10 milliohms maximum

Dielectric Strength:

1,000 megohms minimum @ 500V DC

Mechanical Life: Electrical Life:

2,000V AC minimum 50,000 operations minimum

15,000 operations minimum for S331 & S331F/R/RN 25,000 operations minimum for all others

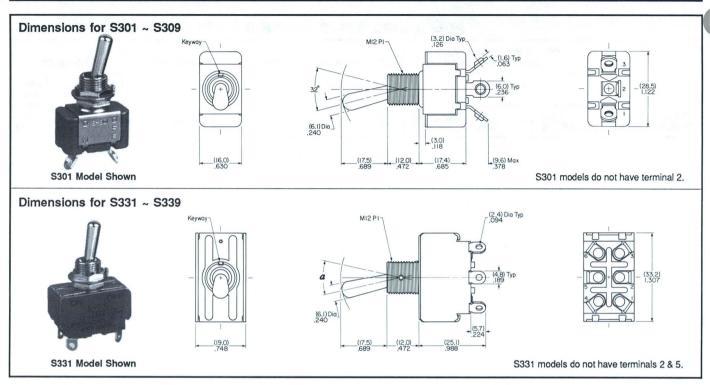
Ambient Temp Range: Angle of Throw: a

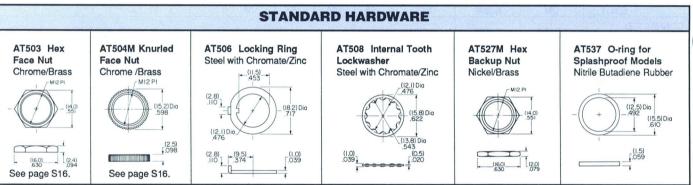
-10°C through +70°C (+14°F through +158°F)  $25^{\rm o}$  for S331s, 332s, 335s, 338s, and 339s 30° for S333s  $32^{\rm o}$  for 300s

# **ADDITIONAL RATING**

When S332 models are used at 25A @ 250V AC, the electrical life drops to 15,000 operations minimum.

# **HIGH RATED/STANDARD SIZE/1 & 2 POLE**





	MAXIMUM EFFEC	TIVE PANEL THICK	NESS & CUTOUTS	
	With Standard Hardware	Without Locking Ring	Without Locking Ring & Bottom Hex Nut	With 1 Hex Nut & O-ring for Splashproof
	(12.5) Dio 492 (9.0) 3.54 (3.0) Dio 118	- (12.5) Dia 492 - (11.5) - (453 - (453 - (453) - (453)	-(12.5) Dia	- (II.I) - 437 - (I2.5) Dia 492
Model Numbers: S1A ~ 7F, S21, S114, 116 S211s	3.0mm/.118" 2.9mm/.114"	4.0mm/.158" 3.9mm/.154"	4.0mm/.158" 3.9mm/.154"	4.0mm/.158"
S30s, 40s S300s, 330s, 400s	4.6mm/.181" 4.7mm/.185"	5.6mm/.220" 5.7mm/.224"	5.6mm/.220" 5.7mm/.224"	
S800s S4012, 530s	4.5mm/.177" 2.5mm/.098"	5.5mm/.217" 3.5mm/.138"	5.5mm/.217" 3.5mm/.138"	, h
S732 S520s Locking Lever Models	2.0mm/.079" 2.3mm/.091" 6.5mm/.256"	3.0mm/.118" 3.3mm/.130" 7.5mm/.295"	3.0mm/.118" 3.3mm/.130" 7.5mm/.295"	174

# **MEDIUM & HIGH RATED/STANDARD SIZE/3 & 4 POLE**

			ILE POSITIO		ELI	ECTRIC	AL CAP	ACITY	TE	RMINA	ALS	0	TOGGLE	S
		(	) = Momenta	ry		Resistive	1	Inductive						Fluo-
POLE &	MODEL	Down CKONMON	Center	Up	AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Solder Lug	Screw	Quick Connect	Bat	Plastic Paddle	cent Tip Padd
3PST	S31 S31F	ON ON	NONE NONE	OFF OFF	25A 25A	9A 9A	20A 20A	10A 10A	X 		 X	X		
CONNEC		1-3 4-6 7-9	OPEN	OPEN			SCHE	MATIC:	le	3	4 6	70	INTERNAL 9 CONNECTIO	N
	S32 S32F	ON ON	NONE NONE	ON ON	25A 25A	9A 9A	20A 20A	10A 10A	X 		 X	X		
	S33 S33F	ON ON	OFF OFF	ON ON	25A 25A	9A 9A	20A 20A	10A 10A	X 		 X	X		
3PDT	S33T S35	ON	OFF NONE	ON (ON)	25A 15A	9A 6A	20A 20A	10A 8A	Χ	X		X		
	S38 S39	(ON) ON	OFF OFF	(ON)	15A 15A	6A 6A	15A 15A	8A 8A	X			X		
CONNEC		2-3 5-6 8-9	OPEN	2-1 5-4 8-7			SCHE	MATIC:		12	•3 4	(COMM)	<b>9</b>	
4PST	S41 S41F S41R S41RN S41T	ON ON ON ON	NONE NONE NONE NONE	OFF OFF OFF OFF	25A 25A 25A 25A 25A	9A 9A 9A 9A 9A	20A 20A 20A 20A 20A	10A 10A 10A 10A 10A	X X X	  X	X 	X X  X	X	 X
CONNEC		1-3 4-6 7-9 10-12	OPEN	OPEN			SCHE	MATIC:	14	Å <sub>3</sub> 40	Å <sub>6</sub> 7.Å	9 10	INTERNAL I2 CONNECTI	ON
	S42 S42F S42R S42RN S42T	ON ON ON ON	NONE NONE NONE NONE	ON ON ON ON	25A 25A 25A 25A 25A	9A 9A 9A 9A 9A	20A 20A 20A 20A 20A	10A 10A 10A 10A 10A	X X X	  X	X 	X X  X	X	 X
4PDT	S43 S43F S43R S43RN	ON ON ON	OFF OFF OFF	ON ON ON ON	25A 25A 25A 25A	9A 9A 9A 9A	20A 20A 20A 20A	10A 10A 10A 10A	X X X		X 	X X 	X	 X
	S45 S48 S48R S48RN	ON (ON) (ON) (ON)	OFF OFF OFF	(ON) (ON) (ON) (ON)	15A 15A 15A 15A	6A 6A 6A 6A	20A 20A 20A 20A	8A 8A 8A 8A	X X X			X	 X	 X
	S49 S49R S49RN	ON ON ON	OFF OFF OFF	(ON) (ON) (ON)	15A 15A 15A	6A 6A 6A	20A 20A 20A	8A 8A 8A	X X X			X 	 X	 X

Terminal numbers are on the switch. Terminal detail page S7. UL Recognized: most S30s & S40s. CSA Certified: S30s, S41, S42, S43; details in Supplement.

# **GENERAL SPECIFICATIONS**

Contact Resistance: 10 milliohms maximum

**Electrical Life:** 

25,000 operations minimum

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Ambient Temp Range:

-10°C through +70°C (+14 °F through +158°F)

Dielectric Strength:

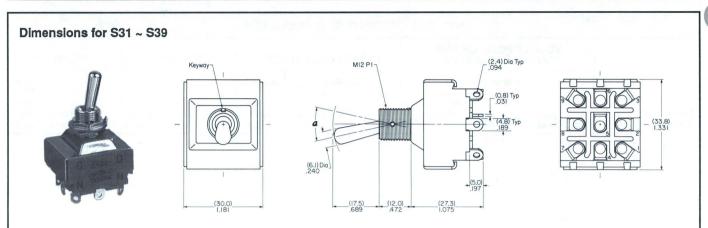
2,000V AC minimum

Angle of Throw: a

30° for S33s & S43s

Mechanical Life: 50,000 operations minimum

25° for all others

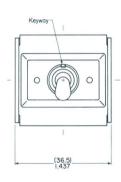


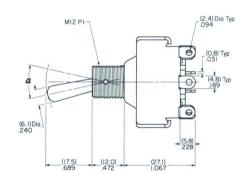
S32 Model Shown

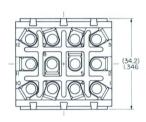
S31 models do not have terminals 2, 5, & 8.

### Dimensions for S41 ~ S49RN









S42 Model Shown

S41 models do not have terminals 2, 5, 8, & 11.

# **PLASTIC LEVERS** R **Flatted Lever** RN **Flatted Fluorescent Tip Lever** Material: ABS Resin Color: Black Only Dimension A = 29.0 mm (1.142") on S100s Dimension A = 27.0mm (1.063") on S40s and S330s

# **LOCKING LEVER** Locking Lever with Panel Seal Models S1AL, S2AL, S3AL, S6AL, S7AL, and S21AL have the locking lever plus panel seal. It is supplied with an alumite finished aluminum cap, hex nut AT503, lockwasher AT508, and o-ring AT537. These models have the same body dimensions as the splashproof models on page S10.

# MOTOR LOAD/STANDARD SIZE/2 POLE/BUSHING MOUNT

				POLES,	CIRC	UITS	, & F	RATI	NGS						
			LE POSITION		EL	ECTRI	CAL C	APACI	TY	TI	ERMINA	ALS		TOGGLE	S
		(	) = Momenta	ry	Resi	stive	Indu	ctive	Motor Load						Fluo-
POLE &	MODEL	Down Keyway	Center	Up	AC 125V	AC 250V	PF 0. AC 125V	75-0.8 AC 250V	AC 125V	Solder Lug	Screw	Quick Connect	Bat	Plastic Paddle	cent Tip Paddle
DPST	S421 S421T	ON ON	NONE NONE	OFF OFF	25A 20A	25A 20A	25A 20A	25A 20A	750W 750W	X 	 X		X		
CONNECTE FERMINALS		1-3 4-6	OPEN	OPEN				SCHE	MATIC:		1	3 4	6 CONN	RNAL NECTION	
	S422 S422T	ON ON	NONE NONE	ON ON	25A 20A	25A 20A	25A 20A	25A 20A	750W 750W	X	X		X		
	S423 S423T	ON ON	OFF OFF	ON ON	25A 20A	25A 20A	25A 20A	25A 20A	750W 750W	X 	X		X		
DPDT	S425 S425T	ON ON	NONE NONE	(ON) (ON)	15A 15A	15A 15A	15A 15A	15A 15A	400W 400W	X	 X		X		
	S428 S428T	(ON) (ON)	OFF OFF	(ON) (ON)	15A 15A	15A 15A	15A 15A	15A 15A	400W 400W	X	 X		X		
	S429 S429T	ON ON	OFF OFF	(ON) (ON)	15A 15A	15A 15A	15A 15A	15A 15A	400W 400W	X	 X		X		
CONNECTE		2-3 5-6	OPEN	2-1 5-4				SCHE	MATIC:			92 (COM)	M) 59		

### **GENERAL SPECIFICATIONS**

Contact Resistance:

10 milliohms maximum

Insulation Resistance:

1,000 megohms minimum @ 500V DC 2,000V AC minimum

Dielectric Strength: Mechanical Life:

50,000 operations minimum 15,000 operations minimum

Electrical Life: Ambient Temp Range:

-10°C through +70°C (+14°F through +158°F)

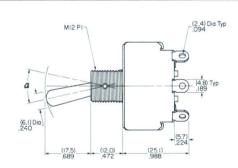
Angle of Throw:

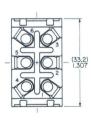
28° for S423s 24° for all others

### Dimensions for S421 ~ S429



(19.0)





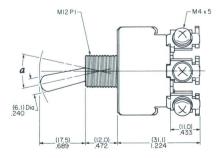
S422 Model Shown

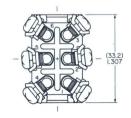
S421 model does not have terminals 2 & 5.

### Dimensions for S421T ~ S429T



- (19.0) - (19.0) - (748





S423T Model Shown

S421T model does not have terminals 2 & 5.

# **HIGH CAPACITY/AC & DC/2 & 3 POLE/BUSHING MOUNT**

THE RESERVE OF THE PARTY OF THE														
25,11			LE POSITIO		ELE	CTRICA	L CAP	ACITY	TI	ERMINA	ALS		TOGGLE	ES
		Down -Keyway	Center	Up		Resistive		Inductive	i	9 1 7				Fluo-
POLE & THROW	MODEL				AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Solder Lug	Screw	Quick Connect	Bat	Plastic Paddle	cent Tip Paddle
DPST	S821	ON	NONE	OFF	30A	30A				Х		Χ		
CONNECTE		2-3 5-6	OPEN	OPEN			SC	CHEMATIC:			2 (COMM)	59		
	S532 S533	ON ON	NONE OFF	ON ON	30A 30A	15A 15A	30A 30A	15A 15A		X		X		
DPDT	S732	ON	NONE	ON	50A	30A	50A	25A		Х		X		
	S822 S823	ON ON	NONE OFF	ON	30A 30A	30A 30A				X		X		
CONNECTE TERMINALS		2-3 5-6	OPEN	2-1 5-4			SC	CHEMATIC:			2 (COMN -3 4	1) 59		
3PST	S831	ON	NONE	OFF	30A	30A				X		X		
CONNECTE TERMINALS		2-3 5-6 8-9	OPEN	OPEN			SC	CHEMATIC:		1-2	/	COMM) 8	•9	
3PDT -	S522 S523	ON ON	NONE OFF	ON ON	30A 30A	15A 15A	30A 30A	15A 15A		X		X		
3701	S832	ON	NONE	ON	30A	30A				X		X		
	S833	ON	OFF	ON	30A	30A				X		X		
CONNECTE TERMINALS		2-3 5-6 8-9	OPEN	2-1 5-4 8-7			so	CHEMATIC:		1	2 59 •3 4•	(COMM)	<b>9</b> 8	

### **GENERAL SPECIFICATIONS**

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 1,000 megohms minimum @ 500V DC for S522, S523,

S732, and S800s

2,000 megohms minimum @ 500V DC for S532, S533 Dielectric Strength:

2,000V AC minimum for S500s & S800s 3,000V AC minimum for S732

Mechanical Life: 50,000 operations minimum

**Electrical Life:** 25,000 operations minimum

Ambient Temp Range: - 10°C through +70°C (+14°F through +158°F)

Angle of Throw: 25° for S522 & S523 27° for S532 & S533

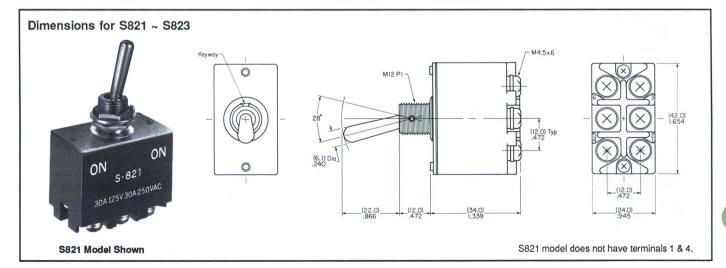
28° for S800s 32° for S732

### **MOUNTING NUTS FOR S SERIES**

All S Series switches are supplied with the same backup nut; however, the face nuts differ as shown in the table below.

Series	Hex Nut AT503	Knurled Nut AT504M	Series	Hex Nut AT503	Knurled Nut AT504M
S1AW~29AW	X		S821~833	X	
S1A~3B		X	S532~732	X	
S21A~7B		X	S522~523	X	
S114~211		X	S821D~833D	X	
S31~39	X		S532D~533D	X	
S41~49	X		S41R~339RN		X
S301~309T	X		S1F~333F	X	
S331~339T	X		S1001~4012		X
S421~429T	X				

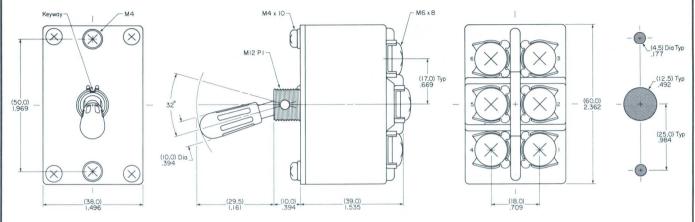
The minor difference in hardware thickness does not change the allowable panel thickness shown on page S14.



# HIGH CAPACITY/AC & DC/2 & 3 POLE/BUSHING MOUNT

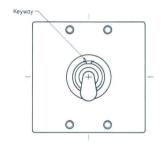
Dimensions for S532 & S533 are given on the following page.

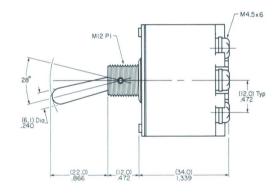
### **Dimensions for S732**

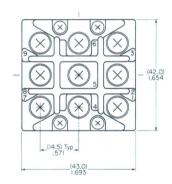


The cap of phenolic resin is black.

### Dimensions for S831 ~ S833

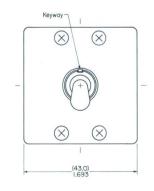


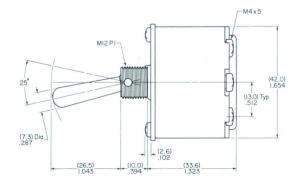


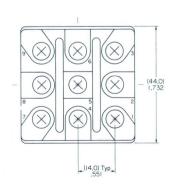


S831 model does not have terminals 1, 4, & 7.

### Dimensions for S522 ~ S523







# HIGH CAPACITY/AC & DC/2 POLE/BUSHING MOUNT

				POLES, O	CIRCL	JITS,	& RAT	INGS						
		7.000	LE POSITIO	STORY OF THE STORY			ELE	CTRICAL	CAPAC	CITY			TERMI	NALS GGLES
		Down	Center	Up				Resistive	Load					
POLE &	MODEL				AC 24V	AC 48V	AC 125V	AC 250V	DC 24V	DC 48V	DC 125V	DC 250V	Screw	Plastic Paddle
DPDT	S532D S533D	ON ON	NONE OFF	ON ON	30A 30A	30A 30A	30A 30A	15A 15A	30A 30A	30A 30A	15A 15A	7.5A 7.5A	X	X
								Inductive	Load			Ti-		
DPDT	S532D S533D	ON ON	NONE OFF	ON ON	30A 30A	30A 30A	30A 30A	15A 15A	15A 15A	10A 10A	6A 5A	3A 3A	X	X
CONNECTI		2-3 5-6	OPEN	2-1 5-4			SCI	HEMATIC:		2 (00	MM) 5 9			

### **GENERAL SPECIFICATIONS**

Contact Resistance:

Insulation Resistance:

:

500 megohms minimum @ 500V DC

Dielectric Strength:

2000V AC minimum 50,000 operations minimum

10 milliohms maximum

Mechanical Life: Electrical Life:

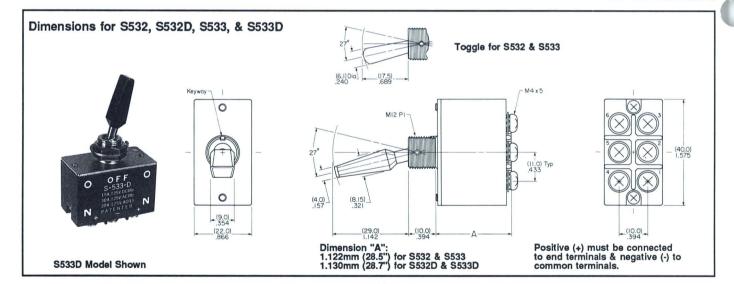
10,000 operations minimum

Ambient Temp Range:

-10°C through +70°C (+14°F through +158°F)

Angle of Throw:

27°



# The high capacity switches are designed to protect contacts by extinguishing the arc which occurs at break. Bar magnets are placed at each end of the switch and their magnetic field opposes the field created by the arcing current thereby extinguishing the arc.

# HIGH CAPACITY/DC/2 & 3 POLE/BUSHING MOUNT

				PULES, C	inculis,	& RATINGS						
		TOGGLE POSITION AND TERMINAL NUMBERS			ELECTRIC	TERMINALS			TOGGLES			
POLE & THROW		DownKeyway	Center	Up	Re	esistive	DC Solder 125V Lug				Plastic Paddle	Fluo- res- cent Tip Paddle
	MODEL				DC 30V				Quick Connect	Bat		
DPST	S821D	ON	NONE	OFF	30A	15A		Х			Х	
CONNECTE		2-3 5-6	OPEN	OPEN		SCHEMATIC:			2 (COMM) •3	59		
DPDT	S822D S823D	ON ON	NONE OFF	ON ON	30A 30A	15A 15A		X			X	
CONNECTE TERMINALS		2-3 5-6	OPEN	2-1 5-4		SCHEMATIC:			/	2 (COMM) 59 •3 4• •6		
3PST	S831D	ON	NONE	OFF	30A	15A		X			X	
CONNECTE TERMINALS		2-3 5-6 8-9	OPEN	OPEN		SCHEMATIC:		/	/	COMM) 8	•9	
3PDT	S832D S833D	ON ON	NONE OFF	ON ON	30A 30A	15A 15A		X			X	
CONNECTE		2-3 5-6 8-9	NONE	2-1 5-4 8-7		SCHEMATIC:		1	2 59	(COMM) •6 7•	<b>9</b>	

### **GENERAL SPECIFICATIONS**

Contact Resistance:

Insulation Resistance:

Dielectric Strength: Mechanical Life:

**Electrical Life:** Ambient Temp Range:

Angle of Throw:

10 milliohms maximum

1,000 megohms minimum @ 500V DC

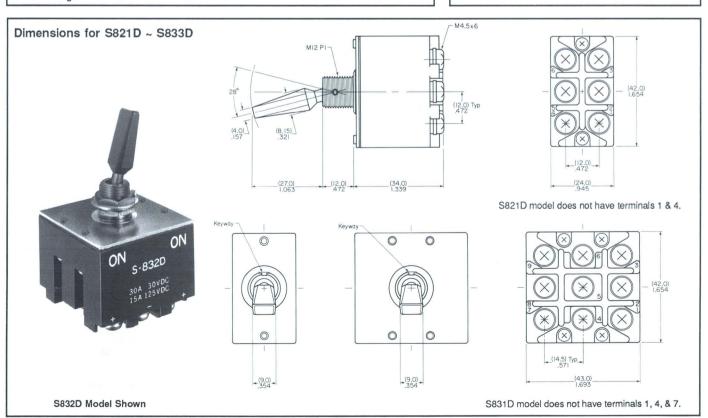
2,000V AC minimum

50,000 operations minimum 10,000 operations minimum

-10°C through +70°C (+14°F through +158°F)

### **DESIGN FOR HIGH CAPACITY**

The high capacity switches are designed to protect contacts by extinguishing the arc which occurs at break. Bar magnets are placed at each end of the switch and their magnetic field opposes the field created by the arcing current thereby extinguishing the arc.



# **NKK** SERIES S ROCKER SWITCHES

				POLES, C	IRCUIT	S, & RA	rings		
- 82.1		TOGGLE POSITION AND TERMINAL NUMBERS  ( ) = Momentary			6 E	LECTRICAL	SCHEMATICS		
					122	Resistive		Inductive	- b- 11
POLE & THROW	MODEL	Down	Center	Up	AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	
SPST	SW3211	ON	NONE	OFF	3A	1.5A	1.5A	1.5A	l <sub>e</sub> 1
CONNECTED TERMINALS		1-2	OPEN	OPEN				W	2
SPST	SW3001A	ON	NONE	OFF	15A	6A	15A	10A	N- INTERNAL
CONNECTED TERMINALS		1-3	OPEN	OPEN					INTERNAL CONNECTION
SPDT	SW3002A SW3003A	ON ON	NONE OFF	ON ON	15A 15A	6A 6A	15A 15A	10A 10A	92 (COMM)
CONNEC		2-3	OPEN	2-1					10 03
DPDT	SW3006A SW3007A SW3008A	ON ON (ON)	NONE OFF OFF	ON ON (ON)	20A 15A 15A	10A 6A 6A	20A 15A 15A	10A 10A 10A	
CONNEC		2-3 5-6	OPEN	2-1 5-4					2 (COMM) 5 3 40 6
DPDT	SW3116	ON	NONE	ON	5A	2A	5A	3A	
CONNEC		2-1 5-4	OPEN	2-3 5-6					

Terminal numbers are on the switch.

### **GENERAL SPECIFICATIONS**

**Contact Resistance:** 

10 milliohms maximum

Insulation Resistance:

200 megohms min. @ 500V DC for SW3211 and SW3116

1,000 megohms min. @ 500V DC for all others

Dielectric Strength:

1,500V AC minimum for SW3211 and SW3116

2,000V AC minimum for all others

Mechanical Life:

30,000 operations minimum

**Electrical Life:** 

10,000 operations minimum

**Ambient Temp Range:** 

-10°C through +70°C (+14°F through +158°F)

Angle of Throw: a

24° for SW3001, SW3002, SW3006 & SW3008

28° for SW3003 & SW3007

Others shown on the dimension drawings

### **DUST COVERS**

A silicone rubber seal beneath the rocker surrounds the actuator stem and prevents entry of contaminants thus protecting the contacts. Dust covers supplied on:

SW3006 SW3007 SW3008 May be ordered on other models by noting after the part number.



# **UL & CSA**

**UL Recognized** 

**CSA Certified** 

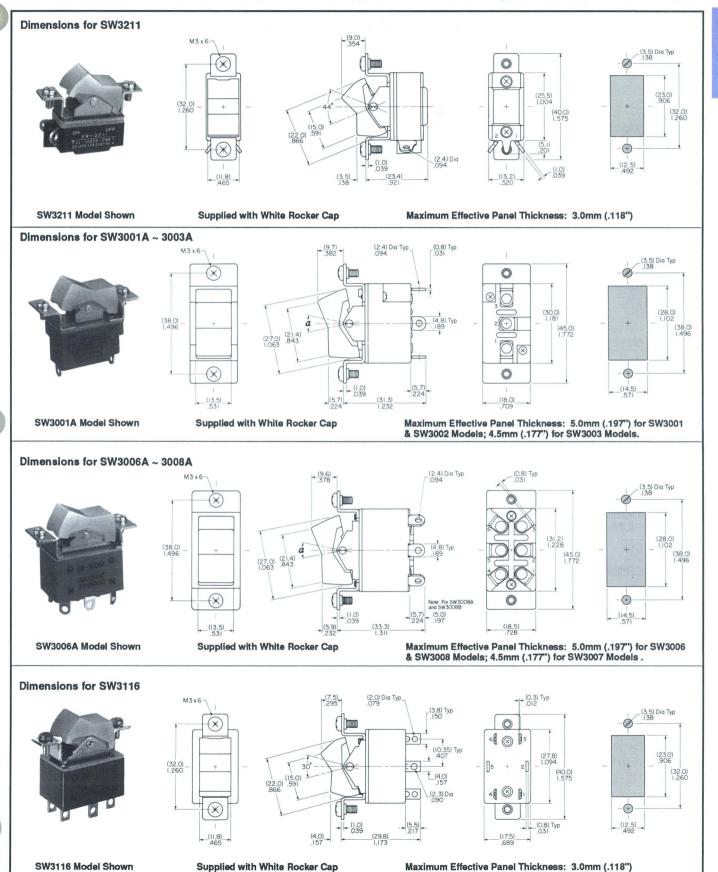
SW3001A SW3002A SW3003A SW3006A SW3001A SW3002A SW3003A SW3006A

SW3007A SW3116 SW3211

Further details can be found in the Supplement.

# **NKK®** SERIES S ROCKER SWITCHES

# STANDARD SIZE/1 & 2 POLE/SUBPANEL MOUNT



# **NKK®** SERIES S ROCKER SWITCHES

# **HIGH CAPACITY/2 & 3 POLE/SUBPANEL MOUNT**

				POLES, C	CIRCUIT	S, & RA1	rings			
		- A. C. C. C. C.	LE POSITION		52(1)	ELECTRICA	L CAPACIT	Υ	SCHEMATICS	
		Down MODEL	Center	Up	M 70-	Resistive		Inductive		
POLE & THROW	MODEL		* *	1	AC 125V	AC 250V	DC 30V	AC 125V PF 0.6		
DPDT	SW3532 SW3533	ON ON	NONE OFF	ON ON	30A 30A	15A 15A	30A 30A	15A 15A	92 (COMM) 59	
CONNE	ECTED NALS	2-3 5-6	OPEN	2-1 5-4					92 (COMM) 59 	
DPST	SW3821	ON	NONE	OFF	30A	30A			A2 (COUL) 5A	
CONNE	ECTED NALS	2-3 5-6	OPEN	OPEN			7		92 (COMM) 59 •3	
DPDT	SW3822 SW3823	ON ON	NONE OFF	ON ON	30A 30A	30A 30A			92 (COMM) 59	
CONNE		2-3 5-6	OPEN	2-1 5-4					92 (COMM) 59 93 49 96	
3PST	SW3831	ON	NONE	OFF	30A	30A			92 59 (COMM) 89	
CONNE TERMI	CTED NALS	2-3 5-6 8-9	OPEN	OPEN					92 59 (COMM) 89 	
3PDT	SW3832 SW3833	ON ON	NONE OFF	ON ON	30A 30A	30A 30A			92 59 (COMM) 98	
CONNE		2-3 5-6 8-9	OPEN	2-1 5-4 8-7					10 03 40 06 70 0	
DPST	SW3821D	ON	NONE	OFF	15A*		30A		•2 (COMM) 5 •	
CONNE	CTED NALS	2-3 5-6	OPEN	OPEN					92 (COMM) 59 	
DPDT	SW3822D SW3823D	ON ON	NONE OFF	ON ON	15A* 15A*		30A 30A		92 (COMM) 59 	
CONNE		2-3 5-6	OPEN	2-1 5-4					•3 4 •6	
3PST	SW3831D	ON	NONE	OFF	15A*		30A		92 59 (COMM) 89	
CONNE TERMIN		2-3 5-6 8-9	OPEN	OPEN					92 59 (COMM) 89 •3 •6 •9	
3PDT	SW3832D SW3833D	ON ON	NONE OFF	ON	15A* 15A*		30A 30A		92 59 (COMM) 98	
CONNE	ECTED NALS	2-3 5-6 8-9	OPEN	2-1 5-4 8-7		-			1 • 3 4 • 6 7 • • 9	
Terminal r	numbers are	on the switch.			* 15A @ 125\	DC Resistive				

### **GENERAL SPECIFICATIONS**

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 1,000 megohms min. @ 500V DC for SW3800s

2,000 megohms minimum @ 500V DC for SW3500s

Dielectric Strength: 2,000V AC minimum **Mechanical Life:** 50,000 operations minimum **Electrical Life:** 25,000 operations minimum

**Ambient Temp Range:** -10°C through +70°C (+14°F through +158°F)

Angle of Throw:

**Nominal Operating Force:** 2,100 grams for SW3532

2,000 grams for SW3533 Off to On 675 grams for SW3533 On to Off

2,450 grams for SW3822

2,600 grams for SW3823 Off to On 1,000 grams for SW3823 On to Off

UL, CSA, & JETL: UL Recognized: SW3820s-3820Ds, SW3830s-3830Ds

CSA Certified: SW3820s-3820Ds, SW3830s-3830Ds JETL for SW3821 at 30A rating plus 750W @ 125V AC.

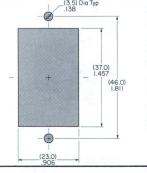
# **DESIGN FOR HIGH CAPACITY**

The high capacity switches are designed to protect contacts by extinguishing the arc which occurs at break. Bar magnets are placed at each end of the switch & their magnetic field opposes the field created by the arcing current thus extinguishing the arc.

# **PANEL THICKNESS & CUTOUT**

Maximum Effective Panel Thickness:

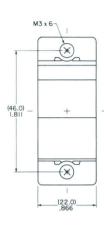
4.5mm (.177")

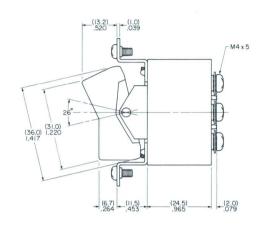


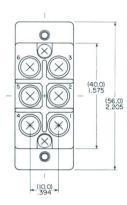
# **NKK** SERIES S ROCKER SWITCHES











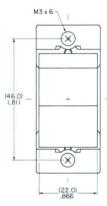
SW3532 Model Shown

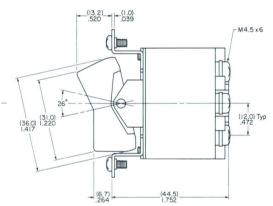
Supplied with White Rocker Cap

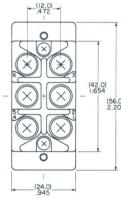
Maximum Effective Panel Thickness: 3.0mm (.118")

### Dimensions for SW3821 ~ SW3823 & SW3821D ~ SW3823D







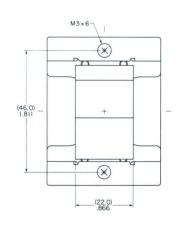


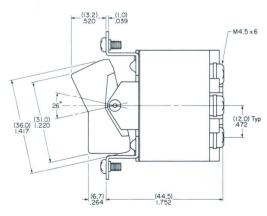
SW3822 Model Shown

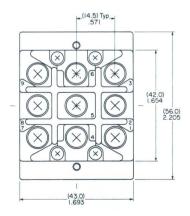
Supplied with White Rocker Cap SW3821 & 3821D do not have terminals 1 & 4.

Max. Effective Panel Thickness: 5.0mm (.197") for SW3001 & 3002 Models; 4.5mm (.177") for SW3003 Models.

### Dimensions for SW3831 ~ SW3833 & SW3831D ~ SW3833D







Supplied with White Rocker Cap SW3831 does not have terminals 1, 4 & 7. Maximum Effective Panel Thickness: 3.0mm (.118")



# **SERIES SB PUSHBUTTON SWITCHES**

# STANDARD SIZE/MOMENTARY/BUSHING MOUNT

			POLES,	CIRCU	JITS,	& RAT	INGS	
POLE & THROW MOD			ON POSITION & L NUMBERS		ELECTRICAL CAPACITY		NALS	SCHEMATICS
		( ) =	Resi	Resistive				
	MODEL	Normal	Down	AC 125V	AC 250V	Solder Lug	Screw	
SPST	SB221NO SB221TNO	OFF OFF	(ON) (ON)	3A 3A	1.5A 1.5A	X 	X	1 1 1 1 1 1 1 1 1 1
CONNECTE TERMINAL:		OPEN	1-2					1 <b>P</b> 2
SPST	SB221NC SB221TNC	ON ON	(OFF) (OFF)	3A 3A	1.5A 1.5A	X	X	
CONNECTE TERMINALS		1-2	OPEN					1 2
DPDT	SB61A SB61B SB63A*	ON ON ON	(ON) (ON) (ON)	10A 3A 10A	5A 1.5A 5A	X X X		92 (COMM) 59 93 49 96
CONNECTE		2-3 5-6	2-1 5-4					1 ● 3 4 ● 6
	Terminal num	bers are on the swit	tch. CSA -	all SB221s	; UL - SB	61A; JETL	- all SB221s.	*SB63A has lockdown.

### **GENERAL SPECIFICATIONS**

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 200 megohms minimum @ 500V DC for SB220s

1,000 megohms minimum @ 500V DC for SB60s

Dielectric Strength: 2,000V AC minimum between contacts

1,500V AC minimum between contacts & case

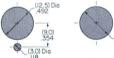
Mechanical Life: 50,000 operations minimum for SB220s 30,000 operations minimum for SB60s

**Electrical Life:** 10,000 operations minimum

**Ambient Temp Range:** -10°C through +70°C (+14°F through +158°F) SB221s 2.95mm (.116") & SB60s 2.4mm (.094") Travel:

### **PANEL CUTOUT & THICKNESS**

SB220 Models: 5.9mm (.232") 4.9mm (.193") 5.9mm (.232")



7.0mm (.276")



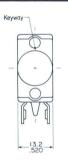
SB60 Models:

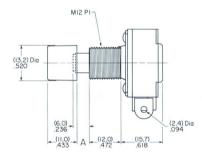
8.0mm (.315") 8.0mm (.315")

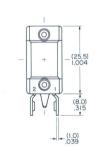
### **Dimensions for SB221 Models**



SB221NO Model Shown w/AT414 Cap







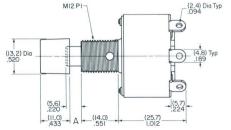
Dimension A: 4.7mm (.185") for NO models & 3.8mm (.150") for NC models.

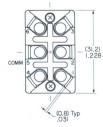
### **Dimensions for SB60 Models**



SB61A Model Shown w/AT414 Cap







Dimension A: 4.3mm (.169") for SB61 models & 3.3mm (.130") for SB63 models. Lockdown for SB63A is achieved by actuating & then turning the button clockwise.

# **NKK** SERIES SB PUSHBUTTON SWITCHES

# STANDARD SIZE/ALTERNATE ACTION/BUSHING MOUNT

			POLES,	CIRCL	JITS,	& RAT	INGS	
		PUSHBUTTON TERMINAL			TRICAL ACITY	TERMINALS		SCHEMATICS
		Normal	Down	Resi	istive			
POLE & THROW	MODEL	Keyway		AC 125V	AC 250V	Solder Lug	Screw	
SPST	SB265 SB265T	ON ON	OFF OFF	6A 6A	3A 3A	Х	х	-4.
CONNECT	ED TERMINALS	1-2	OPEN					1 2
DPDT	SB285 SB25 SB25B	ON ON ON	ON ON ON	6A 15A 5A	3A 9A 3A	X X X		92 (COMM) 59 03 40 66
CONNECT	ED TERMINALS	2-3 5-6	2-1 5-4					10 03 40 00

The state of the second state of the second second

### **GENERAL SPECIFICATIONS**

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 100 megohms minimum @ 500V DC for SB25 & SB25B 200 megohms minimum @ 500V DC for SB265 & SB285

Dielectric Strength: 1,500V AC minimum

Mechanical Life: 30,000 operations minimum 10,000 operations minimum

Ambient Temp Range: -10°C through +70°C (+14°F through +158°F)

Total Travel: SB265 5.4mm (.213"); SB285 & SB25s 4.95mm (.195")

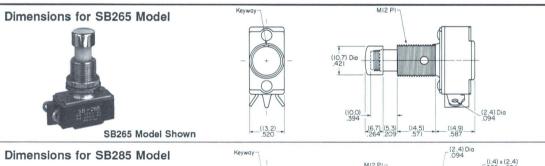
# PANEL CUTOUT & THICKNESS

SB265 7.4mm (.291") 8.4mm (.331") 8.4mm (.331") 7.9mm (.311") 7.9mm (.311") 7.9mm (.311") 7.5mm (.295") 7.5mm (.29

0

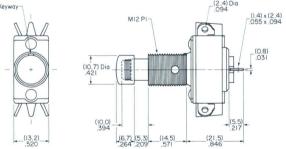
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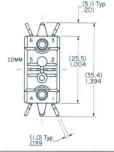
(25.5)





SB285 Model Shown

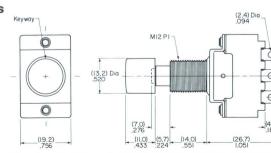


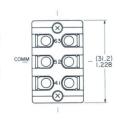


### Dimensions for SB25 & SB25B Models



SB25 Model Shown





NHK° ∫Witche∫ ・ 7850 E. Gelding Dr. ・ Scottsdale, AZ 85260 ・ Phone (602) 991-0942 ・ Fax (602) 998-1435



# **NKK** SERIES SB PUSHBUTTON SWITCHES

# STANDARD SIZE/PUSH-PULL/BUSHING MOUNT

			POLES,	CIRCL	JITS, 8	& RAT	INGS	
POLE & THROW	8	PUSHBUTTON POSITION & TERMINAL NUMBERS			TRICAL ACITY	TERMINALS		SCHEMATICS
		Normal	Down	Resistive			7 77 - 1	
	MODEL	Kayvay		AC 125V	AC 250V	Solder Lug	Screw	
SPST	SB862	ON	OFF	10A	5A	Х		1
CONNECTI TERMINAL		1-2	OPEN					2
DPDT	SB282	ON	ON	6A	ЗА	х		92 (COMM) 59
CONNECTI		2-3 5-6	2-1 5-4					1 <b>●</b> 3 4 <b>●</b> 6

Terminal numbers are not on SB862 but are on SB282. Approvals: JETL - SB862.

# **GENERAL SPECIFICATIONS**

Contact Resistance:

10 milliohms maximum

Insulation Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,500V AC minimum 30,000 operations minimum

Mechanical Life: Electrical Life:

10,000 operations minimum

**Ambient Temp Range:** 

-10°C through +70°C (+14°F through +158°F)

Travel:

SB862 4.5mm (.177") & SB282 1.5mm (.059")

### **PANEL CUTOUT & THICKNESS**

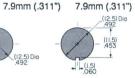
SB862: 5.2mm (.205") SB282: 6.9mm (.272")

6.2mm (.244")

6.2mm (.244") 7.9mm (.311")



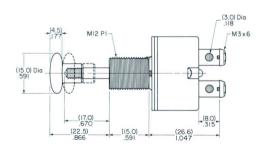


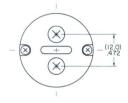


### **Dimensions for SB862 Model**





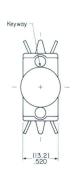


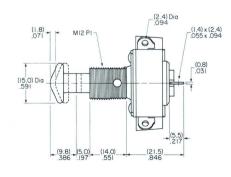


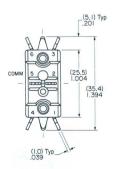
SB862 Model Shown

### **Dimensions for SB282 Model**









SB282 Model Shown

# **NKK** SERIES SDB PUSHBUTTON SWITCHES

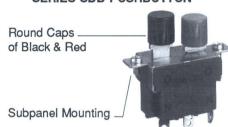
# STANDARD SIZE/ON-ON/SUBPANEL, FLUSH & SNAP-IN

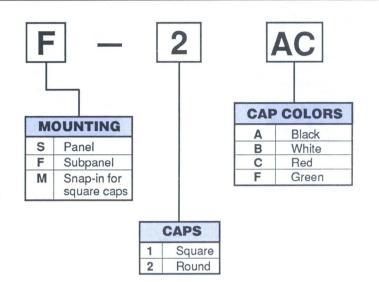
# **TYPICAL SWITCH ORDERING EXAMPLE**

**SDB222** 

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (SDB222F-2AC):

SERIES SDB PUSHBUTTON





# **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

**Resistive Load** 15A @ 125V AC or 10A @ 250V AC or 10A @ 30V DC

**Inductive Load** 15A @ 125V AC PF = (0.6)

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 1,500V AC minimum

Mechanical Life: 50,000 operations minimum

Electrical Life: 25,000 operations minimum

Maximum Temperature: -10°C through +70°C (+14°F through 158°F)

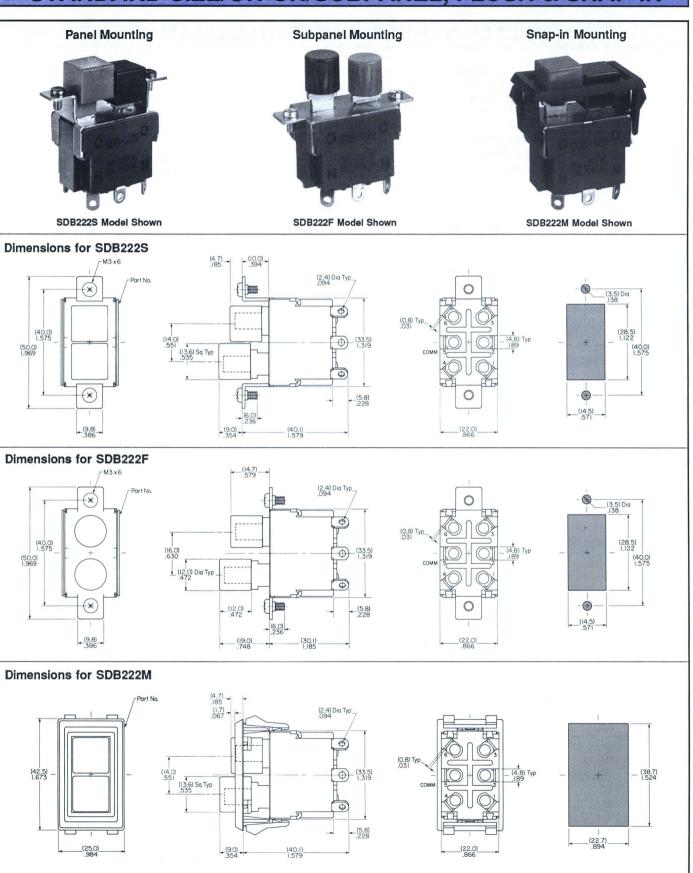
Total Travel: 3.6mm (.142")

		PLUNGER POS	TION & TERMINAL NUMBERS
POLE & THROW	MODEL	Normal	Down
	SDB222S	ON	ON
DPDT	SDB222F	ON	ON
	SDB222M	ON	ON
CONNE TERMII		2-3 5-6	2-1 5-4
SCHEM	ATIC		92 (COMM) 59 

# SNAP-ON CAPS AT440 Square Polycarbonate Colors: A B C F AT439 Round Polycarbonate Colors: A B C F

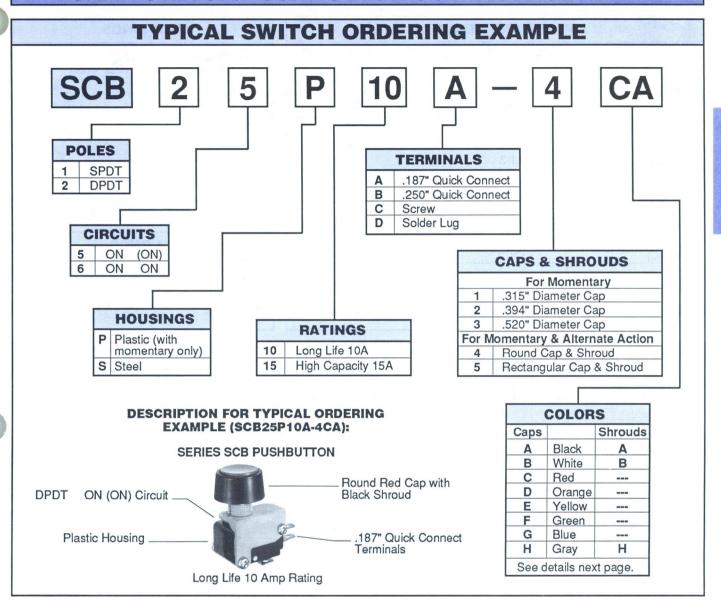


# **NKK** SERIES SDB PUSHBUTTON SWITCHES



# **NKK** SERIES SCB PUSHBUTTON SWITCHES

# SNAP SWITCH/PUSHBUTTON SUPERSTRUCTURE



# **GENERAL SPECIFICATIONS**

Electrical Capacity: Resistive Load

10A & 1/3HP @ 125 or 250V AC for long life models 15A & 1/2HP @ 125 or 250V AC for high capacity models

5A @ 125V AC

Lamp Load
Contact Resistance:

15 milliohms maximum

Insulation Resistance:

100 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

Dielectric Strength:

1,500V AC minimum between contacts and case

Mechanical Life:

5,000,000 operations minimum for long life models 1,000,000 operations minimum for high capacity models

Electrical Life:
Ambient Temperature:

25,000 operations minimum

Travel:

ITavel.

-55°C (-67°F) ~ +82°C (+180°F)

**Operating Force:** 

8 ounces

UL & CSA:

Internal snap switch is UL Recognized & CSA Certified;

Pretravel .047" Overtravel .040" Differential Travel .011"

superstructure is not.

# MOUNTING

Maximum Effective Panel Thickness & Cutout:

Plastic Momentary -4.2mm (.165") 4.0mm (.157") w/shroud

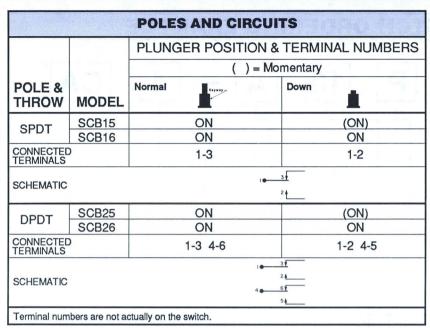
Steel Momentary -4.5mm (.177") 4.0mm (.157") w/shroud

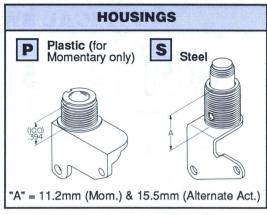
Steel Alternate Action -9.5mm (.374") 9.0mm (.354") w/shroud



# **NKK** SERIES SCB PUSHBUTTON SWITCHES

# SNAP SWITCH/PUSHBUTTON SUPERSTRUCTURE



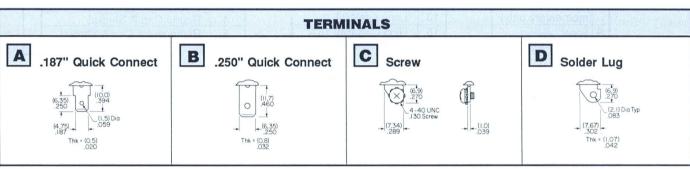


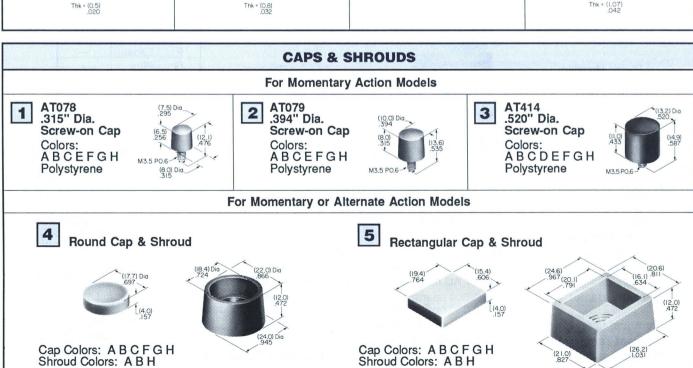


G Blue

**H** Gray

F Green





C Red

**D** Orange

Material: Polycarbonate

E Yellow

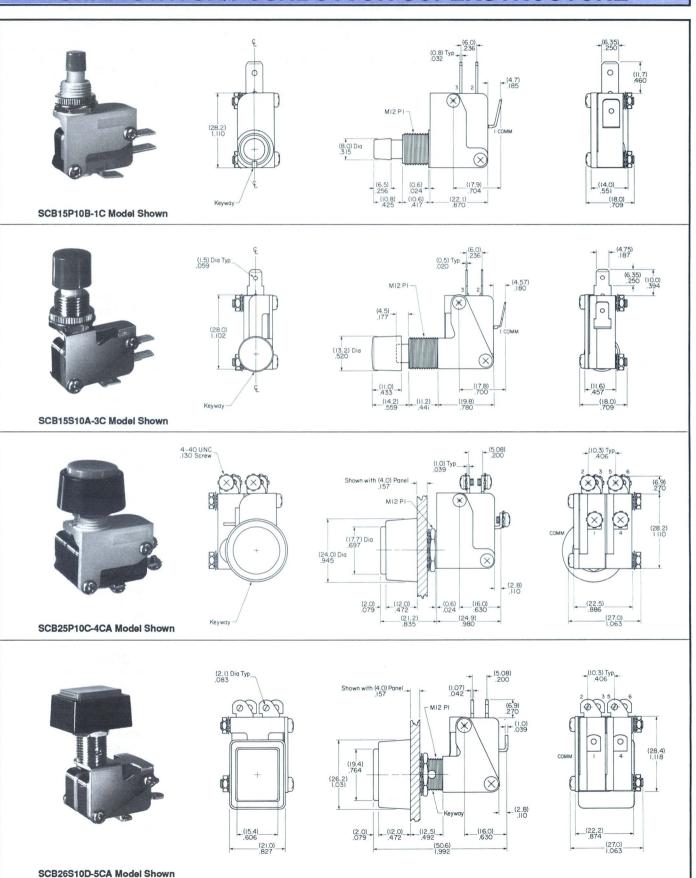
Material: Polycarbonate

Color Codes: A Black

**B** White

# **NKK** SERIES SCB PUSHBUTTON SWITCHES

# SNAP SWITCH/PUSHBUTTON SUPERSTRUCTURE



# **NKK** SERIES HS ROTARY SWITCHES

# 12 AMP/SHORTING & NONSHORTING/30° INDEXING

		P	OLES, CIRCUIT	S, & BODY DEPTH	S	14
POLE	MODEL	NUMBER OF POSITIONS	STOPPER SETTINGS	NUMBER OF TERMINALS	SCHEMATICS	BODY DEPTHS
	HS16-1	2-11	2, 3, 4 11	1 COMM, 11 LOAD		
SP	HS16-1S	2-11	2, 3, 4 11	1 COMM, 11 LOAD		24.5mm
01	HS16-1N	2-11	2, 3, 4 11	1 COMM, 11 LOAD		.965"
	HS16-1SN	2-11	2, 3, 4 11	1 COMM, 11 LOAD	C <sub>1</sub> O <sup>2</sup>	
	HS16-2	2-11	2, 3, 4 11	2 COMM, 22 LOAD	100	
-	HS16-2S	2-11	2, 3, 4 11	2 COMM, 22 LOAD	90 G of Keyway	34.5mm
DP	HS16-2N	2-11	2, 3, 4 11	2 COMM, 22 LOAD		1.358"
	HS16-2SN	2-11	2, 3, 4 11	2 COMM, 22 LOAD	80 O <sub>5</sub>	1.000
	LICACO	0.11	0.0.4.44	0.00444.001.04D		
	HS16-3 HS16-3S	2-11 2-11	2, 3, 4 11	3 COMM, 33 LOAD	On each deck of multi-	44.5
3P	HS16-3S	2-11	2, 3, 4 11 2, 3, 4 11	3 COMM, 33 LOAD 3 COMM, 33 LOAD	pole devices common	44.5mm
	HS16-3SN	2-11	2, 3, 4 11	3 COMM, 33 LOAD	and load terminals are	1.752"
	H310-33N	2-11	2, 3, 4 11	3 COIVIIVI, 33 LOAD	in the same positions as shown in this	
	HS16-4	2-11	2, 3, 4 11	4 COMM, 44 LOAD	schematic.	
4P	HS16-4S	2-11	2, 3, 4 11	4 COMM, 44 LOAD	The switch is viewed	54.5mm
46	HS16-4N	2-11	2, 3, 4 11	4 COMM, 44 LOAD	from the shaft end and	2.146"
	HS16-4SN	2-11	2, 3, 4 11	4 COMM, 44 LOAD	is shown in position 1.	
					Terminals numbers are on the switch bottom.	
	HS16-5	2-11	2, 3, 4 11	5 COMM, 55 LOAD	(Stopper positions are	
5P	HS16-5S	2-11	2, 3, 4 11	5 COMM, 55 LOAD	molded on the top of the	64.5mm
	HS16-5N	2-11	2, 3, 4 11	5 COMM, 55 LOAD	switch.)	2.539"
	HS16-5SN	2-11	2, 3, 4 11	5 COMM, 55 LOAD		
	HS16-6	2-11	2, 3, 4 11	6 COMM, 66 LOAD	IMPORTANT: Switches are supplied	
65	HS16-6S	2-11	2, 3, 4 11	6 COMM, 66 LOAD	without UL marking	74.5mm
6P	HS16-6N	2-11	2, 3, 4 11	6 COMM, 66 LOAD	unless specified. See Supplement for	2.933"
	HS16-6SN	2-11	2, 3, 4 11	6 COMM, 66 LOAD	instructions.	

### **GENERAL SPECIFICATIONS**

Electrical Capacity: 12A @ 125V AC (Resistive Load) 125 V AC

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 200 megohms minimum @ 500V DC

Dielectric Strength:1,500V AC minimumMechanical Life:15,000 operations minimumElectrical Life:7,500 operations minimum

Indexing: 30°

Range of Operating Torque: 5.5 ~ 6.5 kg-cm for first pole

0.5 kg-cm for each additional pole

UL Recognition: HS16 1-pole ~ 6-pole

# SUFFIX CODES

Circuit Types

No Code = Nonshorting S = Shorting

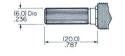
Examples:

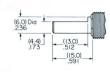
HS16-1 is a single pole nonshorting switch HS16-2S is a double pole shorting switch

Shaft Types

Knurled N = D Flat

No Code = Knurled N = D F





# **NKK** SERIES HS ROTARY SWITCHES

# STANDARD SIZE/6 AMP/NONSHORTING/45° INDEXING

		PO	LES, CIRCUIT	S, & BODY DEPTH	s	
POLE	MODEL	NUMBER OF POSITIONS	STOPPER SETTINGS	NUMBER OF TERMINALS	SCHEMATICS	BODY DEPTHS
SP	HS13-X	2	FIXED	1 COMM, 2 LOAD	C of Keyway	20.0mm .787"
SP	HS13-Y	2-3	FIXED	1 COMM, 3 LOAD	C O   O   O   O   O   O   O   O   O   O	20.0mm .787"
SP	HS13-Z	2-4	FIXED	1 COMM, 4 LOAD	C <sub>1</sub> of Keywoy	20.0mm .787"

The switch is viewed from the shaft end and is shown in position 1. Terminal numbers are NOT on the switch.

### **GENERAL SPECIFICATIONS**

Electrical Capacity: 6A @ 125V AC (Resistive Load) 3A @ 250V AC

5A @ 30V DC

Contact Resistance: 10 milliohms maximum

Insulation Resistance: 200 megohms minimum @ 500V DC

Dielectric Strength: 1,500V AC minimum

Mechanical Life: 15,000 operations minimum

Electrical Life: 7,500 operations minimum

Indexing: 45°

Range of Operating Torque: 1.5 ~ 2.4 kg-cm



HS16-2N Model Shown



HS13-X Model Shown

# **NKK** SERIES PS ROTARY SWITCHES

# 30 AMP/NONSHORTING/ADJUSTABLE STOP/30° INDEXING

		P	DLES, CIRCUIT	S, & BODY DEPTH	S	
POLE	MODEL	NUMBER OF POSITIONS	STOPPER SETTINGS	NUMBER OF TERMINALS	SCHEMATICS	BODY DEPTHS
SP	PS1 PS1-N	2-11 2-11	2, 3, 4 11 2, 3, 4 11	1 COMM, 11 LOAD 1 COMM, 11 LOAD	Ç of Keyway	24.5mm .965"
DP	PS2 PS2-N	2-11 2-11	2, 3, 4 11 2, 3, 4 11	2 COMM, 22 LOAD 2 COMM, 22 LOAD	90 O <sub>5</sub> O <sub>5</sub>	42.0mm 1.654"
ЗР	PS3 PS3-N	2-11 2-11	2, 3, 4 11 2, 3, 4 11	3 COMM, 33 LOAD 3 COMM, 33 LOAD	On each deck of multi- pole devices common and load terminals are in the same positions	59.5mm 2.343"
4P	PS4 PS4-N	2-11 2-11	2, 3, 4 11 2, 3, 4 11	4 COMM, 44 LOAD 4 COMM, 44 LOAD	as shown in this schematic.  The switch is viewed from the shaft end and is shown in position 1.	77.0mm 3.031"
5P	PS5 PS5-N	2-11 2-11	2, 3, 4 11 2, 3, 4 11	5 COMM, 55 LOAD 5 COMM, 55 LOAD	Terminals numbers are on the switch bottom. (Stopper positions are molded on the top of the switch.)	94.5mm 3.720"

# **GENERAL SPECIFICATIONS**

**Electrical Capacity:** (Resistive Load)

30A @ 125/250V AC

**Contact Resistance:** 

10 milliohms maximum

Insulation Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,500 V AC minimum

Mechanical Life:

10,000 operations minimum

**Electrical Life:** 

5,000 operations minimum

Indexing:

30°

Range of Operating Torque:

1.4 kg-cm for each pole

# **SHAFT TYPES** No Code = Knurled N = D Flat (15.0)



# **NKK** SERIES TS ROTARY SWITCHES

# STANDARD SIZE/6 AMP/NONSHORTING/30°INDEXING

		P	DLES, CIRCUIT	S, & BODY DEPTH	S	
POLE	MODEL	NUMBER OF POSITIONS	STOPPER SETTINGS	NUMBER OF TERMINALS	SCHEMATICS	BODY DEPTHS
SP	TS1-N	2-11	2, 3, 4 11	1 COMM, 11 LOAD	Ç of Keyway	22.0mm .866"
DP	TS2-N	2-11	2, 3, 4 11	2 COMM, 22 LOAD	90 - O <sub>5</sub> O <sub>5</sub>	34.0mm 1.339"
3P	TS3-N	2-11	2, 3, 4 11	3 COMM, 33 LOAD	On each deck of multi- pole devices common and load terminals are in the same positions as shown in this	46.0mm 1.811"
4P	TS4-N	2-11	2, 3, 4 11	4 COMM, 44 LOAD	schematic.  The switch is viewed from the shaft end and is shown in position 1.	58.0mm 2.283"
5P	TS5-N	2-11	2, 3, 4 11	5 COMM, 55 LOAD	Terminals numbers are on the switch bottom. (Stopper positions are molded on the top of the switch.)	70.0mm 2.756"

# **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

6A @ 125/250V AC

(Resistive Load)

10 milliohms maximum

Insulation Resistance:

Contact Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,500V AC minimum

Mechanical Life:

30,000 operations minimum

**Electrical Life:** 

10,000 operations minimum

Indexing:

30°

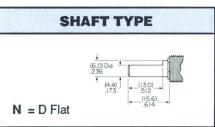
Range of Operating Torque:

For first pole: 0.9 kg-cm

For additional poles: (0.7 kg-cm X total

number of poles) + 1.3 kg-cm





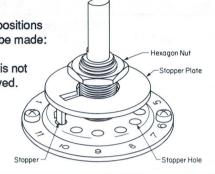
# **NKK®** SERIES HS/PS/TS/ROTARIES

# 1-5 POLE/BUSHING MOUNT

### STOPPER SETTING

Each switch is supplied with the stopper plate set for the maximum number of positions allowed for that model. Prior to installation, the desired stopper setting should be made:

- 1. Be sure the shaft is turned counterclockwise to the extreme left. If the shaft is not turned counterclockwise to the extreme left, proper setting cannot be achieved.
- 2. Loosen the nut far enough to allow raising the stopper plate for resetting.
- Insert the stopper in the numbered hole for the desired stopper setting.
   Satisfactory switch functioning cannot be assured if the stopper plate is not properly positioned.
- 4. Tighten the nut firmly against the stopper plate.



### **KNOBS FOR D-FLAT SHAFTS**

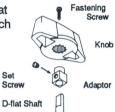


AT432 Small Rotary Knob Phenolic resin Black only



### KNOB ORIENTATION

The rotary knobs used on the D-flat shafts can be oriented on the switch to suit the customer's particular front panel needs simply by sliding the knob over the square adaptor at the preferred orientation.

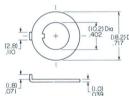


### STANDARD HARDWARE

# AT526 Hex Mntg Nut Nickel/steel



AT518 Locking Ring Chromate/zinc/steel



AT520 Split Lockwasher Chromate/zinc/steel



# HS & TS MODELS: PANEL CUTOUTS & MAXIMUM EFFECTIVE PANEL THICKNESS

# With Locking Ring

HS13 Models: 3.8mm (.150") HS16 & TS Models:

4.8mm (.189")



Without Locking Ring

HS13 Models: 4.8mm (.189")

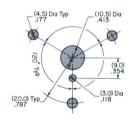
HS16 & TS Models:

5.8mm (.228")



# PS MODELS: PANEL CUTOUTS & MAXIMUM EFFECTIVE PANEL THICKNESS

Without Locking Ring: 4.8mm (.189")

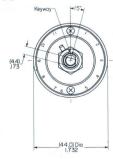


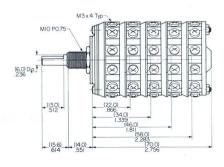
# Recommended Metric Machine Screws for Panel Mounting

McMaster-Carr P/N 92005A218
8mm length for panel thicknesses
1.58mm ~ 4.78mm (.062" ~ .188")
McMaster-Carr P/N 92005A220
10mm length for panel thicknesses

4.78mm ~ 6.78mm (.188" ~ .267")

### **Dimensions for TS**





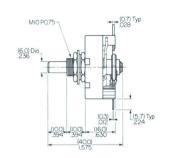


# **NKK®** SERIES HS/PS/TS/ROTARIES

# 1-5 POLE/BUSHING MOUNT

### **Dimensions for HS13**

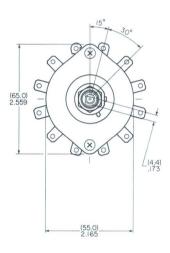


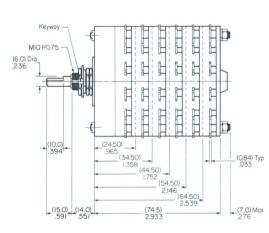


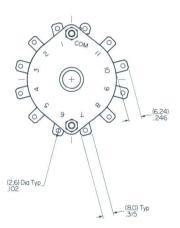


Load terminals on each model: HS13-X 1 & 2; HS13-Y 1, 2 & 3; HS13-Z 1, 2, 3 & 4.

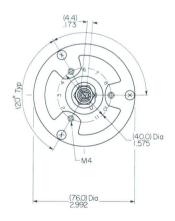
# Dimensions for HS16 with D-flat Shaft (suffix code N)

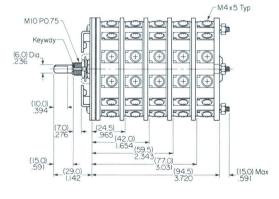






### **Dimensions for PS**





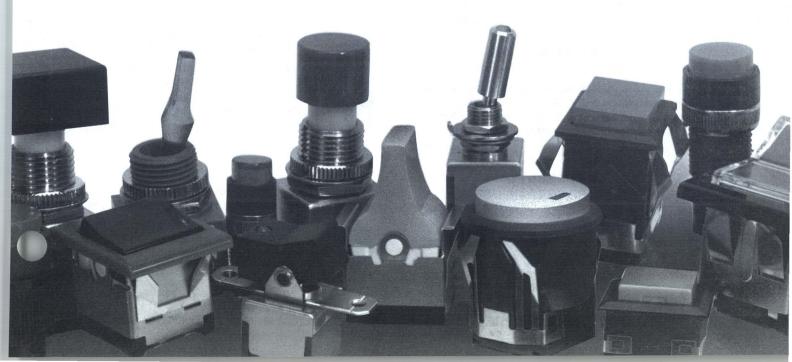


**NOTES** 

# ILLUMINATED SWITCHES

# DISTINCTIVE SERIES

PUSHBUTTONS • ROCKERS • TOGGLES



# NKK® ILLUMINATED

## PUSHBUTTONS/ROCKERS/TOGGLES

NKK's illuminated switch line offers an extensive variety of pushbutton, rocker, and toggle models which utilize LED, neon and incandescent lamps. The variations include micro-subminiature to standard size devices; easy snap-in and bushing mounting styles; 0.4VA to 20 amp ratings; solder lug, PC and quick connect terminals; countless color combinations; square, round, and rectangular shapes. (Relative sizes are shown below.) Illuminated MS Series slides are in Section M, SS Series slides are in Section C, and illuminated JB and JF Series keypads are in Section J.



## HB PUSHBUTTON SUPER-SUBMINIATURE/PANEL MOUNTED

1 pole, alternate action and momentary circuits. 0.1 amp rating. Rear panel bushing mounting. Square or round shapes. LED lighted.

PAGE T3



## UB PUSHBUTTON LOW PROFILE/SNAP-ACTING

1-2 pole, momentary or alternate action circuits. 5 amp or 0.4VA ratings. PCB or snap-in mount. Solder lug or straight PC terminals. LED lighted. Square and rectangular shapes. Varied caps, including spot illuminated.

PAGE T9



## KB PUSHBUTTON MINIATURE/SNAP-ACTING

1-2 pole, maintained and momentary circuits rated at 1 amp or 0.4VA. Bushing or snap-in mounting. Square, round or rectangular shapes. Incandescent, neon or LED illumination.

PAGE T17



## YB PUSHBUTTON SHORT BODY/SNAP-ACTING

1-2 pole, momentary or alternate action circuits. 3 amp or 0.4VA ratings. Bushing or snap-in mount. With or without panel seal. Incandescent and single or bicolor LED illumination.

**PAGE T33** 



## LB PUSHBUTTON STANDARD SIZE/SNAP-IN

1-2 pole, maintained and momentary circuits rated 3 amps or 0.4VA. Square, round or rectangular shapes. Snap-in mounting. Incandescent, neon or LED lighted.

PAGE T49



## LB PUSHBUTTON STANDARD SIZE/PANEL SEAL

1-2 pole, maintained and momentary circuits rated 3 amps or 0.4VA. Round shape. Panel sealed. Rear panel mounting. Incandescent, neon or LED lighted.

PAGE T63



## DLB PUSHBUTTON STANDARD SIZE/POWER RATED

2 pole, momentary or alternate action circuits. 5 amp or 0.4VA ratings. Bushing or snap-in mounting. Square or round caps. LED, incandescent, or neon lamps.

**PAGE T69** 



#### MLW ROCKER & PADDLE MINIATURE/SNAP-IN

1-2 pole, momentary or maintained circuits. 5 amp rating. Snap-in mounted. Incandescent, neon, or LED illumination.

**PAGE T77** 



## **LW ROCKERS**STANDARD SIZE/POWER RATED

The dual lamp model is 2 pole in maintained or momentary circuits 10 amp and 6 amp ratings, snap-in mounting and incandescent or neon lamps. The 20 amp model is single pole, single throw with neon lamp and flush panel mount.

**PAGE T87, 93** 



## M2100 ROCKER & PADDLE SUBMINIATURE/LED TIPPED ACTUATOR

1-2 pole, maintained circuits only. 6 amp or 0.4VA ratings. Flat frame mount rockers. Snap-in and bracketed PCB mount paddles. Single or bicolor synchronous or isolated LED.

PAGE T95



## M2100 TOGGLE SUBMINIATURE/LED TIPPED ACTUATOR

1-2 pole. Maintained circuits only. 6 amp or 0.4VA ratings. Bushing and PC mount. Single or bicolor synchronous or isolated LED.

PAGE T95

# NKK® SERIES HB

## SUPER-SUBMINIATURE/REAR PANEL MOUNTING

## **DISTINCTIVE FEATURES**

LED and spot illumination available. Front panel relamping.

Compact front panel design with .354" square or round shroud size.

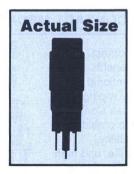
Rear panel threaded mounting. Behind panel depth of less than one inch. 8mm (.315") body diameter fits common size panel cutout.

Latchdown feature gives indication of circuit status. Audible and tactile feedback with smooth and responsive operation.

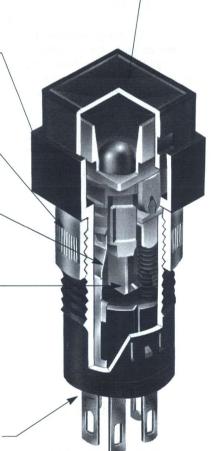
Dual, sliding contacts with self-cleaning action provide contact stability, high reliability and increased operating life.

Minimal contact bounce is achieved with sliding contact mechanism.

Molded-in terminals lock out flux, dust and other contaminants.

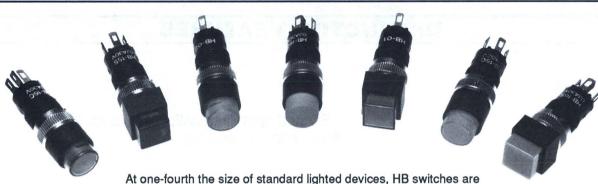


Longer normally closed terminal facilitates wiring and soldering.



## SUPER-SUBMINIATURE/REAR PANEL MOUNTING

## APPLICATION DATA



uniquely suited to applications where space is at a premium. These super-subminiature single pole double throw switches with silver solder lug terminals have a rating of 0.1 amp @ 30V. Square or round shrouds vary the front panel appearance. A single element LED provides illumination for colored transparent caps and spot illuminated cap. Also available are matching indicators. Solid caps are suitable for nonilluminated applications. HB series switches are recognized by Underwriters Laboratories Inc. (UL File No. E44145).

## **GENERAL SPECIFICATIONS**

**Electrical Capacity:** (Resistive Load)

0.1A maximum @ 30V AC/ DC

**Contact Resistance:** 

50 milliohms maximum

Insulation Resistance:

100 megohms minimum @ 500V DC

**Dielectric Strength:** 

500V AC minimum

**Mechanical Life:** 

100,000 operations minimum

**Electrical Life:** 

50,000 operations minimum

Pretravel:

2.2mm (.087")

**Overtravel:** 

0.8mm (.031")

**Total Travel:** 

3.0mm (.118")

**Ambient Temp Range:** 

Illuminated: -25°C through +50°C (-13°F through +122°F) Nonilluminated: -25°C through +70°C (-13°F through +158°F)

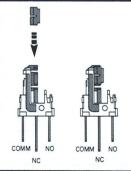
**Nominal Operating Force:** 

350 grams

MATERIALS & FINISHES			
Housing	Housing Glass fiber reinforced polyamide		
Base Glass fiber reinforced polyamide			
Movable Contact Phosphor bronze with silver plating			
Stationary Contacts Phosphor bronze with silver plating			
Common Terminal Phosphor bronze with silver plating			
End Terminals Phosphor bronze with silver plating			
Lamp Terminals	Phosphor bronze with silver plating		

## **SLIDING CONTACT MECHANISM**

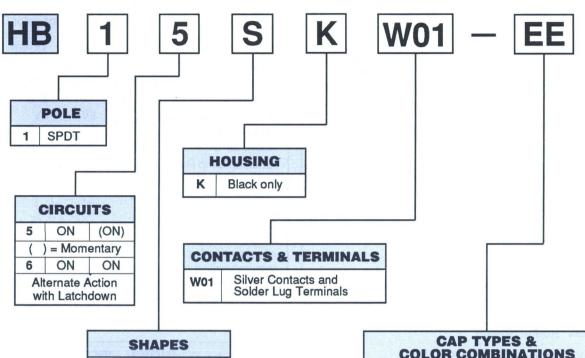
The unique sliding contact mechanism offers benefits unavailable in conventional mechanisms. A dual wiping movable contact slides along the stationary contacts to provide excellent contact stability. increased operating life, and high reliability. Contact operation is break before make.





## SUPER-SUBMINIATURE/REAR PANEL MOUNTING

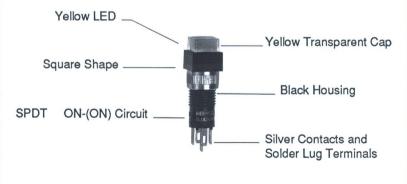




	SHAPES
S	Square
C	Round

## **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE** (HB15SKW01-EE):

**SERIES HB PUSHBUTTON** 



**IMPORTANT:** Switches are supplied without UL marking unless specified. See Supplement for instructions.

COLOR COMBINATIONS			
Transparent Cap Lens/Diffuser Colors & LED Colors			
CC	Red Lens/Diffuser with Red LED		
EE	Yellow Lens/Diffuser with Yellow LED		
FF	Green Lens/Diffuser with Green LED		
BC	White Diffuser with Red LED		
BE White Diffuser with Yellow LED			
BF	White Diffuser with Green LED		
	Square Spot Illuminated Cap Cap/LED Colors		
AC	Square Black Cap with Red LED		
AE	Square Black Cap with Yellow LED		
AF	Square Black Cap with Green LED		
	Nonilluminated Cap Colors		
A	Black (square only)		
В	White		
С	Red		
E	Yellow		
F	Green		
G	Blue		

## SUPER-SUBMINIATURE/REAR PANEL MOUNTING

POLES AND CIRCUITS				
		PLUNGER POSITION & TERMINAL NUMBERS		
	1	( )=	Momentary	
		Normal	Down	
POLE & THROW	MODEL		574 💻 🗡	
SPDT	HB15 HB16	ON ON	(ON) ON	
CONNEC TERMIN		1-3	1-2	
SCHEM Power		2 I (COMM) 3	L(+)	

Terminal numbers are not actually on the switch, but labels "NO, NC, C, L" are. LED circuit is isolated and requires an external switch.

#### SHAPES



.354" Square Shroud

Square shroud for use with square cap. The shroud is an integral part of the switch body and comes in black only.





.354" Round Shroud

Round shroud for use with round cap. The shroud is an integral part of the switch body and comes in black only.



#### HOUSING



Housing available in black only.

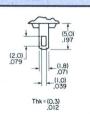
#### RATING, CONTACTS, AND TERMINAL TYPE



0.1 Amp Rating

Silver Contacts

Solder Lug Terminals



## **SOLDERING AND WIRING**

Soldering Specifications

3 seconds @ 350°C 5 seconds @ 270°C

**Wiring Specifications** 

The .039" X .079" oblong hole accommodates one solid or stranded 20-gauge wire or two 22-gauge wires.

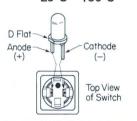
#### **LED SPECIFICATIONS**



AT 616 Single Element LED
Used with Transparent,
Spot Illuminated, & Indicator Caps

Cold	ors:	Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	30mA	20mA	30mA
Continuous Fwd Curre	nt I <sub>F</sub>	24mA	16mA	24mA
Forward Voltage V <sub>F</sub>	2.04V	1.88V	2.02V	
Reverse Peak Voltage	V <sub>RM</sub>	5V	5V	5V
Current Reduction Rat Above 25°C	e ΔI <sub>F</sub> mA/°C	0.40 mA/°C	0.26 mA/°C	0.40
Ambient Temp Range		-2	5°C ~ +50	O°C

The electrical specifications shown are determined at a basic temperature of 25°C. If the source voltage exceeds rated voltage, the required ballast resistor value can be calculated by using the formula shown in the supplement.



Correct LED Orientation:
D flat opposite black dot inside actuator block.

#### **LATCHDOWN MECHANISM**

The latchdown feature on alternate action circuits provides visible, audible, and tactile feedback. The cap extends 1.3mm (.051") above the shroud when in latchdown position. Smooth and responsive operation is achieved with the design of this mechanism.



#### MOUNTING

**Recommended Panel Thickness:** 0.5mm ~ 5.0mm (.020" ~ .197"). Overtightening the mounting nut may damage the switch housing.

**PCB Mounting:** Solder lug terminals are spaced .100" X .200". This enables PCB mounting which can be accomplished by elongating PC board holes to .080".

#### **Tools for Mounting and Relamping**





#### **CAP TYPES & COLOR COMBINATIONS**

Color Codes:

A Black

**B** White

C Red

E Yellow

F Green

G Blue

#### **Transparent Cap for LED**

Color Codes:

**Colored Lens** 

Red Diffuser CC with Red LED

Yellow Diffuser EE with Yellow LED

> Green Diffuser with Green LED

Clear Lens

White Diffuser with Red LED

White Diffuser with Yellow LED

White Diffuser with Green LED

AT4031 Square

AT4032 Round



Transparent Lens



Translucent Colored Diffuser



Colored LED AT616

Polycarbonate

## **Spot Illuminated Cap for LED**

**Black Opaque** Cap/LED

Color Codes:

AT4052

Square

Black Cap with Translucent Window



Colored LED AT616





Polycarbonate

## **Nonilluminated Cap**

Cap

**Color Codes:** 

(black in square only)













AT4035

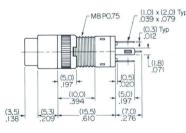
Square

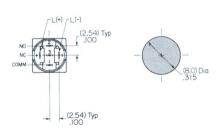
## Square/Solder Lug Terminals/Single Pole

Polycarbonate with matte finish



(9.0) Sq

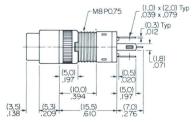


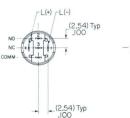


HB15SKW01-CC Model Shown

## Round/Solder Lug Terminals/Single pole







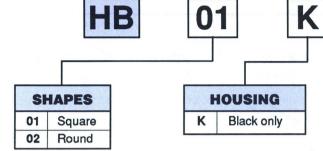


HB16CKW01-CC Model Shown

# **NKK** SERIES HB INDICATORS

## SUPER-SUBMINIATURE/REAR PANEL MOUNTING





## **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (HB01KW01-CC):**

#### **SERIES HB INDICATOR**



<u> </u>	01 – $0$
TEI	RMINAL TYPE
W01	Silver Solder Lug

	CAP & LED COLORS
CC Red Lens/Diffuser with Red LED	
EE	Yellow Lens/Diffuser w/Yellow LED
FF	Green Lens/Diffuser w/Green LED
BC	White Diffuser with Red LED
BE	White Diffuser with Yellow LED
BF	White Diffuser with Green LED

Details for the shapes, housing, terminals, LED, and mounting are on page T6.

## **CAP & LED COLOR COMBINATIONS**

**Color Codes:** 

**Colored Lens** 

CC

Red Diffuser with Red LED

EE

Yellow Diffuser with Yellow LED

FF

Green Diffuser with Green LED

#### Clear Lens

BC

White Diffuser with Red LED

BE

White Diffuser with Yellow LED

BF

White Diffuser with Green LED

## AT4033

Square

Round

AT4034



Polycarbonate

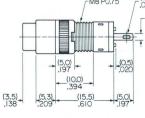
Used with LED AT616

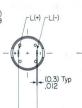
## Square & Round Indicators with Solder Lug Terminals

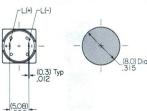












HB02KW01-FF Model Shown

# NKK SERIES UB

## SHORT BODY/SNAP ACTION/PCB & SNAP-IN MOUNTING

## **DISTINCTIVE FEATURES**

Light diffusion designed to give bright, full surface illumination.

Long life LED is an integral part of the switch. \_

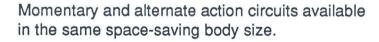
Combination of PCB mountability and short body allows use in compact applications.

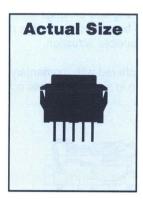
Extra low profile of a half inch.

Small behind panel dimension for \_ snap-in mounting in tight spaces.

Snap-acting contact mechanism \_ provides sensitive actuation with audible feedback.

> Precision design of switching mechanism extends life.





Latchdown mechanism, independent of switching mechanism, gives visible, audible, and tactile indication of circuit status.

> Terminals are epoxy sealed to lock out flux. \_\_ solvents, and other contaminants.

> > UL recognized and CSA certified.

## SHORT BODY/SNAP ACTION/PCB & SNAP-IN MOUNTING

## **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

5A @ 125/250V AC & 5A @ 30V DC for silver 0.4VA maximum @ 28V AC/DC maximum for gold (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

50 milliohms maximum for silver 100 milliohms maximum for gold

Insulation Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life:

1,000,000 operations minimum for momentary action 200,000 operations minimum for alternate action

**Electrical Life:** 

10,000 operations minimum for silver with resistive load of 5A @ 125V AC 100,000 operations minimum for silver with resistive load of 3A @ 125V AC

200,000 operations minimum for gold

Pretravel:

1.7mm (.067")

Overtravel:

0.6mm (.024")

**Total Travel:** 

2.3mm (.091")

**Ambient Temp Range:** 

Illuminated: -20°C through +50°C (-4°F through +122°F)
Nonilluminated: -20°C through +70°C (-4°F through +158°F)

Nominal Operating Force:

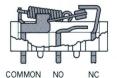
Single Pole: 160 grams for Square & 194 grams for Rectangular Double Pole: 260 grams for Square & 316 grams for Rectangular

MATERIALS & FINISHES			
Housing/Bezel	Glass fiber reinforced polyamide (UL 94V-0)		
Snap-in Frame	Stainless steel		
Movable Contactor	Phosphor bronze		
Movable Contact	Silver alloy or copper with gold plating over nickel		
Stationary Contacts	Silver alloy or copper with gold plating over nickel		
Power Terminals	Phosphor bronze with silver or gold plating		
Switch Lamp Terminals	Brass with tin-lead plating		
Indicator Lamp Terminals	Brass with tin-lead plating		
Base	Glass fiber reinforced diallylphthalate (UL 94V-0)		

## **SNAP-ACTION MECHANISM**

The UB pushbutton has a single break snap-action contact mechanism. The combined butterfly formation and spring action of the movable contact create the quick-make, quick-break characteristic which limits arcing and prolongs electrical life. An added benefit of this design is the sensitive and audible actuation.

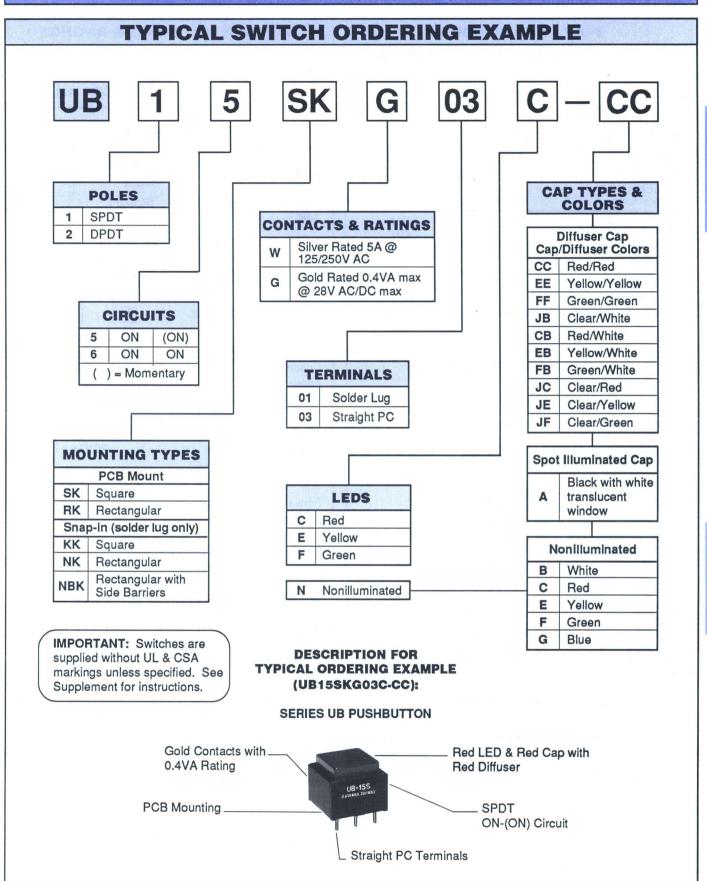
This switch is offered with momentary or alternate action in single or double pole configurations.



## **DKK**®

## **SERIES UB PUSHBUTTON SWITCHES**

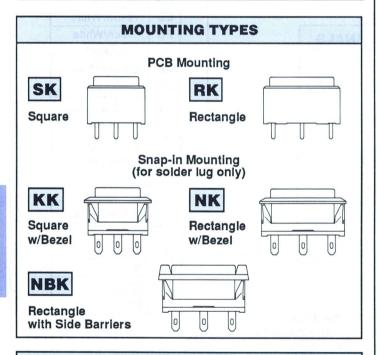
## SHORT BODY/SNAP ACTION/PCB & SNAP-IN MOUNTING



## SHORT BODY/SNAP ACTION/PCB & SNAP-IN MOUNTING

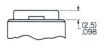
POLES AND CIRCUITS			
			R TERMINAL NUMBERS Momentary
POLE & THROW	MODEL	Normal	Down
SPDT	UB15 UB16	ON ON	(ON) ON
CONNEC		1-3	1-2
SCHEM Power		1 (COMM)	L(+) • (-)L
DPDT	UB25 UB26	ON ON	(ON) ON
CONNEC	CTED ALS	1-3 4-6	1-2 4-5
SCHEM Power		3 02 60 05	L(+) - (-)L

Terminal numbers are not actually on the switch but labels are (NC, NO, COM, L+, L-). LED circuit is isolated and requires an external switch.



## **LATCHDOWN MECHANISM**

The latchdown feature on alternate action circuits provides visible, audible, and tactile feedback. The cap extends 1.0mm (.039") above the body or built-in bezel when in the latchdown position.





Normal Position

Latchdown Position

#### **CONTACT MATERIALS & RATINGS**

Silver Rated 5A @ 125/250V AC



Gold Rated 0.4VA maximum @ 28V AC/DC maximum

## **TERMINALS**

01

Lug









## **LED SPECIFICATIONS**

#### For Square Type

C





Colors: Red Yellow Green Forward Peak Current 30mA 20mA 20mA Continuous Fwd Current 20mA 15mA 15mA Forward Voltage 2.0V 1.9V 1.95V Reverse Peak Voltage 5V 5V 5V Current Reduction Rate 0.40 0.27 0.27 Above 25°C mA/°C mA/°C mA/°C -25°C ~ +70°C Ambient Temp Range

#### For Rectangular Type

Colors: Forward Peak Current Continuous Fwd Current Forward Voltage Reverse Peak Voltage **Current Reduction Rate**  $\Delta I_{-}$ Above 25°C Ambient Temp Range

Red Yellow Green 60mA 40mA 40mA 40mA 30mA 30mA 2.0V 1.9V 1.95V 5V 5V **5V** 0.80 0.54 0.54 mA/°C mA/°C mA/°C -25°C ~ +70°C

Single element LEDs are an integral part of the UB device (1 LED in the square and 2 LEDs in the rectangular). LEDs are not available separately.

Electrical specifications shown are determined at a basic temperature of 25°C. If the source voltage exceeds rated voltage, a ballast resistor is required. Calculate resistor value by using the formula shown in the supplement.

#### **SOLDERING & WIRING SPECIFICATIONS**

Soldering Time & Temperature Limits are 3 seconds at 350°C or 5 seconds at 270°C.

Terminal Holes are .032" X .063" oblong & accommodate 1 solid 20-gauge wire or 2 solid or stranded 22-gauge wires.

lluminated

## KK SERIES UB PUSHBUTTON SWITCHES

## SHORT BODY/SNAP ACTION/PCB & SNAP-IN MOUNTING

## **CAP TYPES & COLOR CODES**

#### Cap Colors:









Polycarbonate

Diffuser Colors:









Polycarbonate

Transparent Cap with Diffuser for Illuminated

AT4074 Square



AT4117 Rectangular



AT4075

Diffuser for AT4074 Square Cap



AT4118 Diffuser for AT4117 Rectangular Cap



Note: Both cap & diffuser colors must be selected; the "white" (code B) diffuser has a frosted texture.

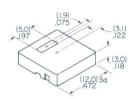
#### Spot Illuminated Cap



Black Cap with Translucent Window for LED Display

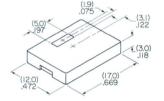
Polycarbonate with matte finish

AT4119 Square



**Opaque Cap for Nonilluminated** 

AT4120 Rectangular



#### Available Colors:



C









AT4116 Rectangular



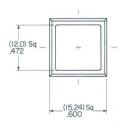
Polycarbonate

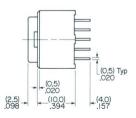
Color Codes: B White C Red E Yellow F Green G Blue J Clear

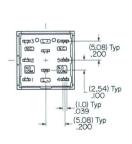
Legending can be accomplished with pad printing, engraving, or film insert. Maximum film thickness for film inserting between the cap and diffuser is 0.15mm (.006"). Optional cap removal tool AT109 is shown in Accessories section.

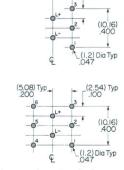
#### Square/PCB Mount with Straight PC Terminals/Single & Double Pole











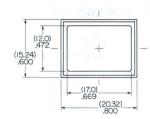
UB15SKG03C-CB Model Shown

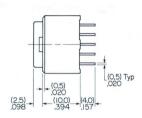
Single pole models do not have terminals 4, 5, & 6. Nonilluminated models have no lamp terminals.

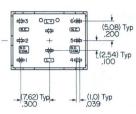
## **BODY/SNAP ACTION/PCB & SNAP-IN MOUNTING**

## Rectangular/PCB Mount with Straight PC Terminals/Single & Double Pole







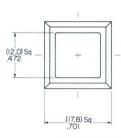


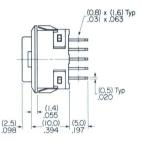
UB26RKG03E-EE Model Shown

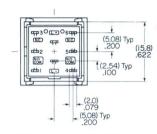
Single pole models do not have terminals 4, 5, & 6. Nonilluminated models have no lamp terminals.

#### Square/Snap-in Mount with Bezel & Solder Lug Terminals/Single & Double Pole







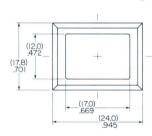


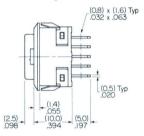
UB25KKW01C-CB Model Shown

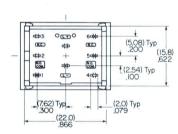
Single pole models do not have terminals 4, 5, & 6. Nonilluminated models have no lamp terminals.

## Rectangular/Snap-in Mount with Bezel & Solder Lug Terminals/Single & Double Pole







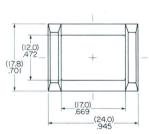


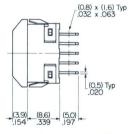
UB26NKW01F-FF Model Shown

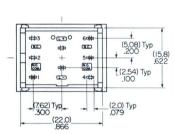
Single pole models do not have terminals 4, 5, & 6. Nonilluminated models have no lamp terminals.

## Rectangular/Snap-in Mount with Side Barriers & Solder Lug Terminals/Single & Double Pole





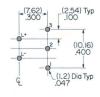


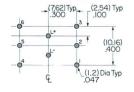


UB25NBKW01F-FB Model Shown

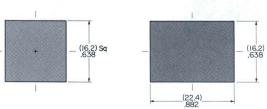
Single pole models do not have terminals 4, 5, & 6. Nonilluminated models have no lamp terminals.

#### PCB Footprints for Rectangular





## Panel Cutouts for Square & Rectangular Snap-in

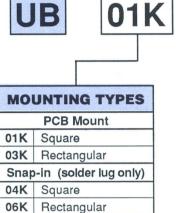


Panel Thickness: 1 ~ 3.2mm (.039" ~ .126")

## SERIES UB INDICATORS

## SHORT BODY/PCB & SNAP-IN MOUNTING





W03

## **TERMINALS**

W01	Silver Solder Lug
W03	Silver Straight PC

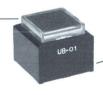
	LEDS
С	Red
E	Yellow
F	Green

CAP/DIFFUSER COLORS			
CC	Red/Red		
EE	Yellow/Yellow		
FF	Green/Green		
JB	Clear/White		
CB	Red/White		
EB	Yellow/White		
FB	Green/White		
JC	Clear/Red		
JE	Clear/Yellow		
JF	Clear/Green		

SERIES UB INDICATOR

**DESCRIPTION FOR** TYPICAL ORDERING EXAMPLE (UB01KW03C-JC):





**PCB** Mounting

Silver Straight PC Terminals

Details about terminals. LED specifications, and cap information are on pages T12-13.

## **MOUNTING TYPES**

PCB Mounting with PC Terminals

01K

Square

03K

Rectangle



Snap-in with Built-in Bezel (solder lug only)

04K

Square

06K

Rectangle



## **TERMINAL TYPES**

W01

Silver Solder Lug





Silver Straight PC



## LEDS

C E

F

Red

LED specifica-Yellow tions are given

on page T16.

Green

Single element LEDs are an integral part of each UB indicator (1 LED in the square model and 2 LEDs in the rectangular model). LEDs are not available separately.

#### TRANSPARENT CAP WITH DIFFUSER

Complete cap detail is shown on page T13, including colors and dimension drawings.

Square Cap AT4074 Square Diffuser AT4075



Rectangular Cap AT4117 Rectangular Diffuser AT4118



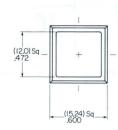


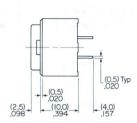
## **SERIES UB INDICATORS**

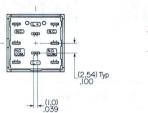
## **BODY/PCB & SNAP-IN MOUNTING**

## Square/PCB Mount with Straight PC Terminals





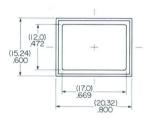


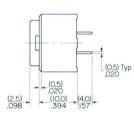


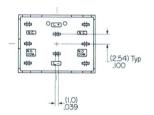
UB01KW03C-JC Model Shown

## Rectangular/PCB Mount with Straight PC Terminals







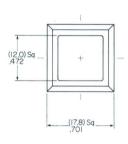


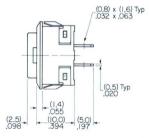


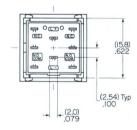
UB03KW03F-JF Model Shown

## Square/Snap-in Mount with Solder Lug Terminals







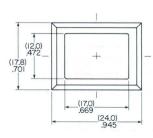


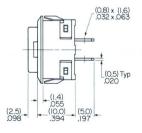
UB04KW01C-JC Model Shown

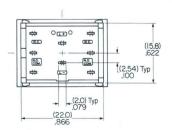
Panel Cutouts on page T14.

## Rectangular/Snap-in Mount with Solder Lug Terminals









UB06KW01E-EE Model Shown

Panel Cutouts on page T14.

# NKK SERIES KB

## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

## **DISTINCTIVE FEATURES**

Bright illumination with numerous color variations. Spot illumination available. Square, rectangular, and round shaped caps. Cap inscriptions are available.

Incandescent, LED, and neon lamps. Front panel relamping.

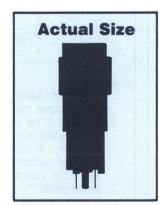
8mm (.315") panel thickness capability. Rear panel bushing or snap-in mounting.

Stainless steel frame on snap-in models has a specially designed projection which prevents rotation and correctly orients switch in panel.

Latchdown feature gives indication of circuit status. Audible and tactile feedback with smooth and responsive operation.

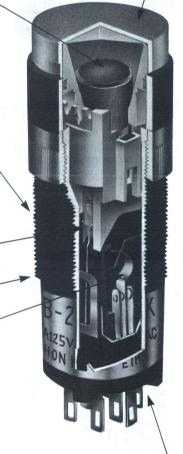
12mm (.472") body diameter. \_\_

Snap-action mechanism for \_\_\_\_long life.





Optional PCB adaptors in straight and right angle types.



# NKK® SERIES KB

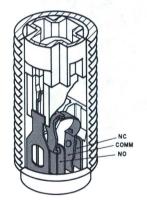
## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

## **APPLICATION DATA**



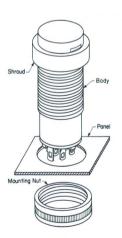
Miniature KB Series switches are available in single or double pole, maintained or momentary circuits rated 1 amp at 125V AC or 0.4VA. These round bodied switches are rear panel or snap-in mountable. Standard terminals are solder lug with optional adaptors for straight or right angle PC mounting. Square, round, and rectangular caps are available to match the shroud shapes. Optional splash covers or protective guards are also offered. Full face illumination is provided by LED, incandescent or neon lamp.

#### **SNAP-ACTING MECHANISM**



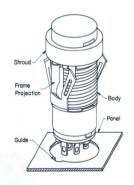
The KB pushbutton, available in single and double pole, utilizes a snap-acting contact mechanism which provides long electrical life and pronounced sensitivity. The contact mechanism is double throw with a normally closed and normally open contact. Tactile feedback is transmitted to the cap from an independent latchdown mechanism.

#### **BUSHING MOUNTING**



A nickel-plated brass nut (AT057) is used to fasten the switch in place from the back of the panel.

#### **SNAP-IN MOUNTING**



A stainless steel snap-in frame allows mounting from the front of the panel. In addition to ease of mounting and resistance to corrosion, the frame projection prevents rotation when inserted into the panel guide.

## & SNAP-IN MOUNTING

## **GENERAL SPECIFICATIONS**

With Silver Contacts for Power Circuits

With Gold Contacts for Logic Level Circuits

**Electrical Capacity:** (Resistive Load)

1A@ 125V AC 1A @ 250V AC 1A @ 30V DC

0.4VA maximum @ 28V AC/DC max (Applicable Range 0.1mA ~ 0.1A @

20mV ~ 28V)

Contact Resistance:

50 milliohms maximum

50 milliohms maximum

Insulation Resistance:

1,000 megohm minimum @ 500V DC

1,000 megohm minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts 1,500V AC min between contacts & case 750V AC minimum between contacts 1,500V AC min between contacts & case

Mechanical Life:

100,000 operations minimum

100,000 operations minimum

**Electrical Life:** 

50,000 operations minimum

100,000 operations minimum

**Contact Bounce:** 

0.3 ~ 0.8 milliseconds

0.3 ~ 0.8 milliseconds

**Ambient Temp Range:** 

-25°C through +50°C (-13°F through +122°F) for illuminated -25°C through +70°C (-13°F through +158°F) for nonilluminated Note: When used with a polyvinyl chloride splash cover,

the lowest limit is 0°C (32°F).

**Nominal Operating Force:** 

Single Pole

Double Pole

Maintained 100-250 grams

Maintained 150-350 grams

Momentary 100-200 grams

Momentary 150-300 grams

Travel:

Pretravel 2.2mm (.087"); Overtravel 0.8mm (.031"); Total Travel 3.0mm (.118")

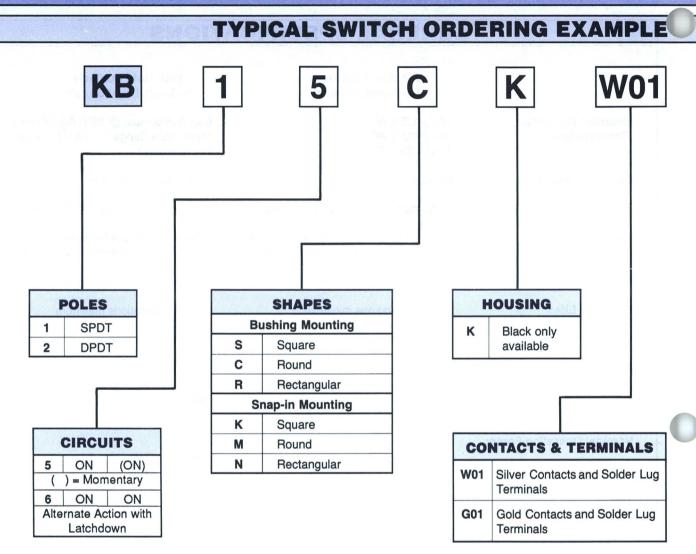
MATERIALS & FINISHES			
Housing	Polyamide (94V-0 UL Flammability Rating)		
Movable Contactor	Silver for power circuit Copper with gold plating for logic level circuit		
Stationary Contacts	Silver for power circuit Copper with gold plating for logic level circuit		
Housing Base	Polyamide (94V-0 UL Flammability Rating)		
Terminal Base	Polybutylene terephthalate (94V-0 UL Flammability Rating)		
Common Terminals	Phosphor bronze with silver flash plating for power circuit Phosphor bronze with gold flash plating for logic level circuit		
End Terminals	Brass with silver flash plating for power circuit Brass with gold flash plating for logic level circuit		
Lamp Terminals	Phosphor bronze with nickel flash plating		

#### UL & CSA

KB switches are recognized by Underwriters Laboratories Inc. at the following rating: 1 amp @ 125/250V AC 1A @ 30V DC 0.4VA @ 28V AC/DC UL File No. E44145

KB switches are certified by Canadian Standards Association at the following ratings: 1 amp @ 125/250V AC. 1A@30V DC, & 0.4VA @ 28V AC/DC max CSA File Nos. LR 23535 and LR56017

## MINIATURE/REAR PANEL & SNAP-IN MOUNTING



## DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (KB15CKW01-12-JF):

**SERIES KB PUSHBUTTON** 



## AND ASSEMBLY ORDERING EXAMPLE

## **LAMPS**

## CAP TYPES & COLOR COMBINATIONS

-61	Incandescent Lamp used with Solid Cap	
00	No Lamp	
05	5-volt	
12	12-volt	
28	28-volt	

	Solid Lens/Filt	d Cap er Colors	
AA	BF	*EB	*CC
*BB	BG	*FB	*FF
ВС	*CB	*GB	*GG
* Standa	ard Lens/F	ilter Com	binations

In	candescent or Neon Lamp used with Insert Cap
05	5-volt
12	12-volt
28	28-volt
01	110-volt Neon
Nec	on not available with JF & JG.

Insert Cap Lens/Filter Colors		
JB	Clear with White	
JC Clear with Red		
JE	JE Clear with Yellow	
JF Clear with Green		
JG	Clear with Blue	

Incandescent or Neon Lamp used with Spot Illuminated Cap	
05	5-volt
12	12-volt
28	28-volt
01 110-volt Neon	

Cap/Lamp Colors		
AB	Square Black Cap only with White Window	

LED used with Spot Illuminated Cap		
10	Single Element	
20	Double Element	

1	Square Spot Illuminated Cap Cap/LED Colors		
	AC Square Black Cap/Red LED		
	AE Square Black Cap/Yellow L		
	AF	Square Black Cap/Green LED	

used with Cap for LED		
10	Single Element	
20	Double Element	

Cap for LED Diffuser/LED Colors				
CC	CC Red with Red LED			
EE	EE Yellow with Yellow LED			
FF Green with Green LED				
BC White with Red LED				
BE	BE White with Yellow LED			
BF	BF White with Green LED			

Color Codes: A Black B White C Red E Yellow F Green G Blue J Clear

## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

POLES AND CIRCUITS				
		PLUNGER POSITION 8	TERMINAL NUMBERS	
		( )=	Momentary	
		Normal	Down	
POLE & THROW	MODEL	-		
SPDT	KB15 KB16	ON ON	(ON) ON	
CONNECTED TERMINALS		2-3	2-1	
SCHEMATICS Power/Lamp		2 (COMM)	L(+) ●────── (-) L	
DPDT	KB25 KB26	ON ON	(ON) ON	
CONNECTED TERMINALS		2-3 5-6	2-1 5-4	
SCHEMATICS Power/Lamp		2 (COMM) 5 0 6 0 4	L(+) ●───── (-) L	

Terminal numbers are not actually on the switch; "+" and "-" are molded on the base. Lamp circuit is isolated and requires an external switch.

## **SHAPES & MOUNTING TYPES**

**Shroud for Bushing Mounting** 





.551" Dia. Round



.551" x .728" Rectangular







## Shroud for Snap-in Mounting

551" K Square



.551" Dia. Round



.551" x .728" Rectangular







#### HOUSING

Housing available in black only.

## RATING, CONTACT MATERIAL AND TERMINAL TYPES

**W01** 

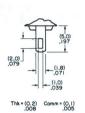
**Power Circuit** 

Silver Contacts Solder Lug Terminals

**G01** 

0.4VA **Logic Level Circuit** 

**Gold Contacts** Solder Lug Terminals



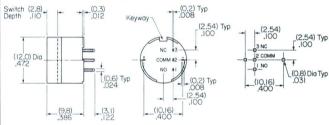
#### **OPTIONAL PCB ADAPTORS**

Note: Adaptors are ordered separately.

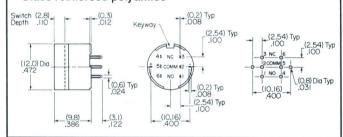
AT701

Single Pole Straight PC Terminals

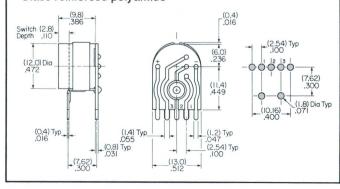
Glass reinforced polyamide



#### AT702 **Double Pole Straight PC Terminals** Glass reinforced polyamide



## **AT077** Single Pole Right Angle Terminals Glass reinforced polyamide



## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

#### LAMPS

The electrical specifications shown below are determined at a basic temperature of 25°C. Lamp circuit is independent of switch operation. Dimension drawings of lamps are in the accessories section at the end of this catalog. If the source voltage exceeds the lamp's rated voltage, the required ballast resistor value can be calculated by using the formula at the end of the catalog.

#### **Incandescent Lamp**

## AT611 Incandescent Lamp

05 5 Volt

12 Volt

28 28 Volt

**Endurance** 



T-1 Standard Bi-pin

Used with Solid Colored, Colored Insert and Spot Illuminated Caps

	<b>ELECTRIC</b>	AL SPECIFI	CATIONS	
Voltage	V	5V AC	12V AC	28V AC
Current	1	115mA	60mA	24mA

#### Single Element LED

AT614 10 Single Element



T-11/2 Cylindrical

7,000 hours average

Used with Cap for LED and Spot Illuminated Cap

ELECTI	RIC	AL SPECIFIC	CATIONS	
		Red	Yellow	Green
Forward Peak Current				
l l	FM	50mA	50mA	50mA
Continuous Forward Current	lF	40mA	40mA	40mA
(SCHOOL POINT)	'F		401117	401117
Forward Voltage	$V_{F}$	1.75V	2.35V	2.35V
Reverse Peak Voltage				
V	RM	4V	4V	4V
Current Reduction Rat	e			
Above 25°C	۱F	0.67mA/°C	0.67mA/°C	0.67mA/°C

#### **Neon Lamp**

AT615 01 **Neon Lamp** 



T-1 Standard Bi-pin

Used with Colored Insert and Spot Illuminated Caps

ELECTRICAL SPECIFICATIONS				
Voltage	V	110V AC		
Current	1	1.5mA		
Endurance		10,000 hours		

Recommended Resistors: 33K ohms for 110V AC 100K ohms for 220V AC

#### **Double Element LED**

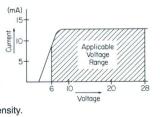
AT612 20 **Double Element** 



Used with Cap for LED and Spot Illuminated Cap

ELECTRICAL	SPEC	IFICATIO	NS	
		Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	20mA	20mA	20mA
Continuous Forward Current	l I <sub>F</sub>	13	mA Avera	ige
Forward Voltage	$V_{F}$		$6\sim28V$	1 002
Forward Peak Voltage	$V_{FM}$	30V	30V	30V
Reverse Peak Voltage	$V_{RM}$	30V	30V	30V
Current Variable Rate	$\Delta I_{F}$	$V_F = 1$	10 ~ 24V	±20%

A built-in IC chip maintains constant current when used within a 6-28V range. Voltage surges beyond 28 volts will burn down the IC chip. The IC chip's regulation of voltage eliminates the need for a ballast resistor and results in a low current consumption of 13mA average, as illustrated in the accompanying graph. Double elements in the LED result in brighter intensity.



## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

#### CAP TYPES & COLOR COMBINATIONS

**Color Codes:** 

A Black

**B** White

C Red

E Yellow

F Green

G Blue

J Clear

Solid Colored Cap for Incandescent Lamp

Lens/Filter **Color Codes:** 

BB

GB BC

BF

BG

CB GG AT485

Polycarbonate

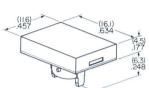
Square

AT487

Square

AT486 Round

AT4021 Rectangular



Rectangle not available in black.

Translucent Colored Lens



Translucent Colored Filter



Lamp (AT611)

## Colored Insert Cap for Incandescent Lamp

Lens/Filter **Color Codes:** 

JB

JC

JE

JF JG

Polycarbonate

**AT488** Round



AT4022 Rectangular



Transparent Clear Lens



Translucent Colored Filter



Lamp (AT611)

## Colored Insert Cap for Neon Lamp

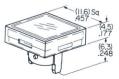
Lens/Filter **Color Codes:** 



JC

JE

**AT487** Square



**AT488** Round



AT4022 Rectangular





Transparent Clear Lens



Translucent Colored Filter



Lamp (AT615)

Polycarbonate



## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

#### **CAP TYPES & COLOR COMBINATIONS**

Color Codes:

A Black Green

F

**B** White G Blue

C Red J Clear E Yellow

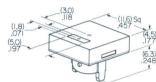
Spot Illuminated Cap for Neon or Incandescent Lamp

Cap

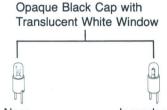
Color Code:

AB

AT4051 Square



Polycarbonate



Neon Lamp (AT615)

Incandescent Lamp (AT611)

#### Spot Illuminated Cap for LED

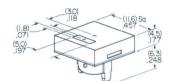
Cap/LED **Color Codes:** 



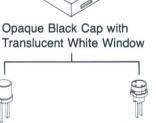


Polycarbonate

AT4051 Square







**Double Element** LED (AT612)

#### Cap for LED

Diffuser/LED **Color Codes** 



BC BE

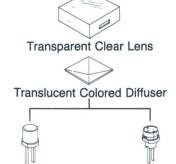


BF



**AT490** Round





AT4023 Rectangular

Polycarbonate

Single Element LED (AT614)

**Double Element** LED (AT612)

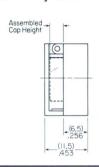
## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

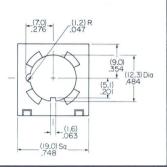
#### **OPTIONAL ACCESSORIES**

## **AT494**

**Protective Guard for Square & Round** 

Lid: Polycarbonate Polyamide Base:

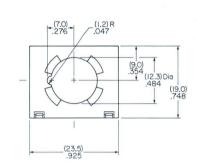




#### AT4024 **Protective Guard for Rectangular**

Lid: Polycarbonate Polyamide Base:



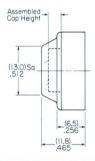


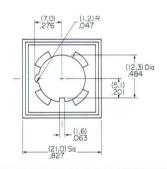
Note: Protective guards reduce the depth of switch behind panel by .047".

## AT495

Splash Cover for Square & Round

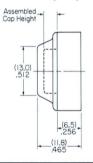
Polyvinyl Chloride Cover: Base: Polyethylene

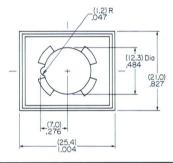




## AT4025 Splash Cover for Rectangular

Polyvinyl Chloride Base: Polyethylene

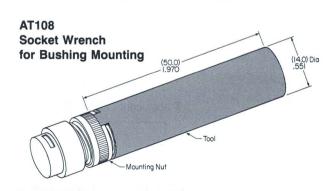




Note: Polyvinyl chloride loses pliability below 0°C (32°F).

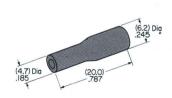
Splash covers reduce the depth of switch behind panel by .047".

#### TOOLS



Overtightening the mounting nut may damage the switch housing.

## AT107 **Lamp Extractor**

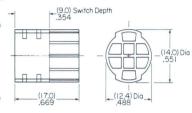




## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

#### **CROSSOVER GUARD**

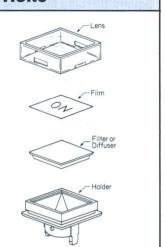
A partitioned plastic quard is supplied with each switch to provide insulation between terminals. Installation of the guard requires the following sequence of steps:



- (1) Identify wire-to-terminal connections.
- (2) Thread wires through the guard.
- (3) Solder the connections.
- (4) Push the guard fully onto the switch body.

#### INSCRIPTIONS

Inscriptions can be placed on the lens. diffuser/filter, or a film inserted between the two. Details regarding hot stamping or engraving can be obtained from the factory.



#### **SOLDERING & WIRING**

Soldering time for the solder lug and PC is less than three seconds at 350°C or five seconds at 270°C.

The .039" × .079" oblong hole accommodates one solid or stranded 20-gauge wire or two solid or stranded 22-gauge wires.

#### **LATCHDOWN DIMENSION**

The cap extends 1.4mm (.055") above the shroud when in the latchdown position.



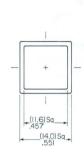
El El	FECTIVE PANEL THICKN	ESS AND PANEL CUTOU	rs
	Bushing Mounting without Keyway	Bushing Mounting with Keyway	Snap-in Mounting
Panel Thickness:	0.5 ~ 8mm (.020 ~ .315")	0.5 ~ 8mm (.020 ~ .315")	1.0 ~ 3.5mm (.039 ~ .138")
Panel Cutout:	(12.3) Dia	(1.8) (4.9) .193 (12.3) Dia	(1.2.) R 0.47 (12.3) Dia -(6.8) -(6.8)

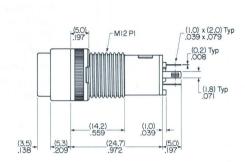
Panel thickness range is  $0.5\sim6.8$ mm (.020  $\sim$  .268") when using the splash cover or protective guard.

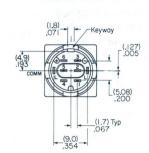
## MINIATURE/REAR PANEL & SNAP-IN MOUNTING











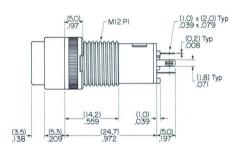
KB15SKW01-05-GG Model Shown

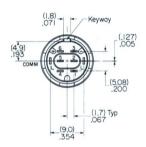
Terminals 4, 5 & 6 are not on single pole models.

## Round/Bushing Mounting/Solder Lug/1-2 Pole







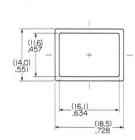


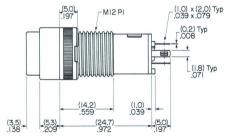
KB25CKW01-05-GG Model Shown

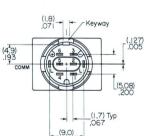
Terminals 4, 5 & 6 are not on single pole models.

#### Rectangular/Bushing Mounting/Solder Lug/1-2 Pole









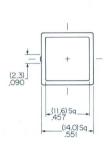
KB15RKW01-05-GG Model Shown

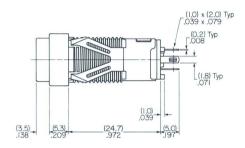
Terminals 4, 5 & 6 are not on single pole models.

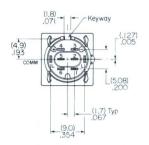
## **PANEL & SNAP-IN MOUNTING**









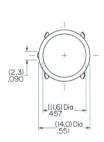


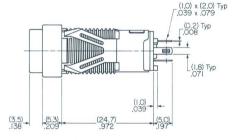
KB16KKW01-10-FF Model Shown

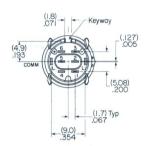
Terminals 4, 5 & 6 are not on single pole models.

#### Round/Snap-in Mounting/Solder Lug/1-2 Pole







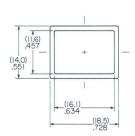


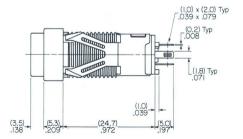
KB26MKW01-10-FF Model Shown

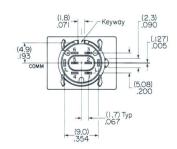
Terminals 4, 5 & 6 are not on single pole models.

#### Rectangular/Snap-in Mounting/Solder Lug/1-2 Pole







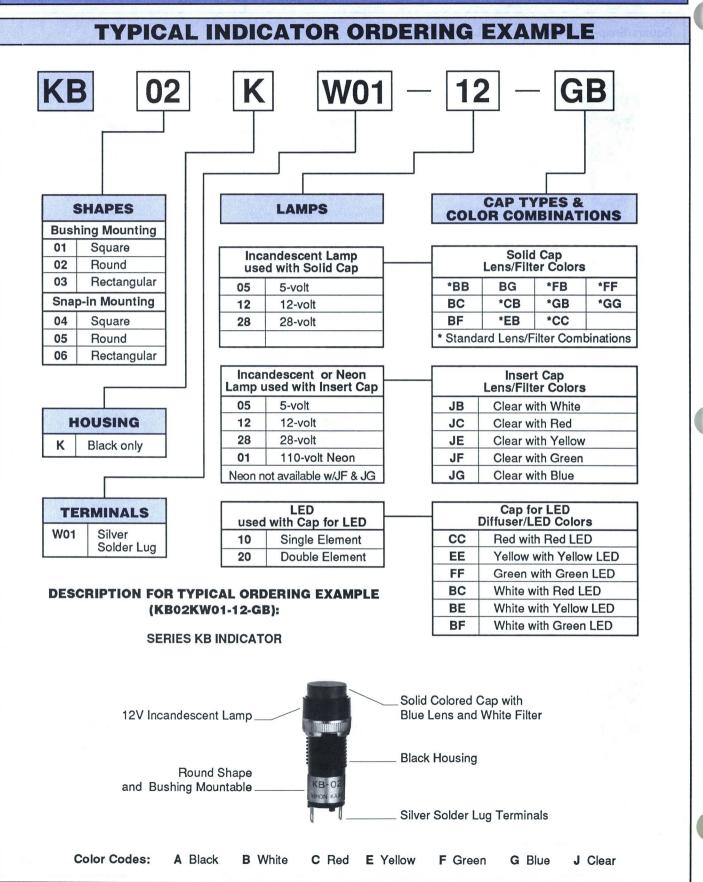


KB16NKW01-10-FF Model Shown

Terminals 4, 5 & 6 are not on single pole models.

# **NKK** SERIES KB INDICATORS

## MINIATURE/REAR PANEL & SNAP-IN MOUNTING



## **NKK** SERIES KB INDICATORS

## IAP-IN MOUNTING

#### SHAPES AND MOUNTING TYPES

#### **Shroud for Bushing Mounting**

.551" 01 Square

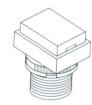


.551" Dia. Round









## Shroud for Snap-in Mounting

.551" 04 Square



.551" x .728" 06 Rectangular







Shroud shape determines the shape of cap. The shroud is an integral part of the indicator body which comes in black only.

#### LAMPS

Electrical specifications for lamps and LEDs are given with the previous KB switch data.

AT611 05 5 Volt

AT611 12 Volt

AT611 28 28 Volt





Used with Solid Colored and Colored Insert Caps

T-1 Standard Bi-pin

Neon

AT615 110 Volt



Used with Colored Insert Cap

T-1 Standard Bi-pin

LED

AT614 10 Single Element

AT612 20 **Double Element** 





Used with Cap for LED

T-11/2 Cylindrical

#### HOUSING



Housing available in black only.

#### **TERMINALS**

**W01** 

Silver Solder Lug Terminals

## CAPS

Cap dimension drawings are given with the previous KB switch data.

**Color Codes:** 

**B** White C Red E Yellow F Green **G** Blue J Clear

Solid Colored Cap

Lens/Filter Color Codes:

BB

AT485

**AT486** 

AT4021

BF CC

BC

BG FF

GB

CB

GG Polycarbonate

EB

Colored Insert Cap

Lens/Filter Color Codes:



AT487

AT4022

**AT488** 

JC

JG





JE Polycarbonate

Note: JF & JG not available with neon

Cap for LED

Diffuser/LED Color Codes:

**AT489** 

**AT490** 

AT4023

BE

BF







Polycarbonate

T-11/2 Cylindrical

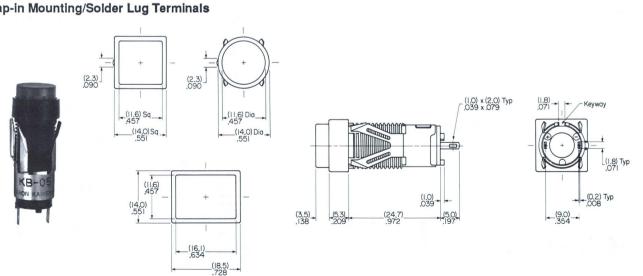
# **NKK** SERIES KB INDICATORS

## MINIATURE/REAR PANEL & SNAP-IN MOUNTING

100000000000000000000000000000000000000	Bushing Mounting without Keyway	Bushing Mounting with Keyway	Snap-in Mounting
Panel Thickness:	0.5 ~ 8.0mm (.020 ~ .315")	0.5 ~ 8.0mm (.020 ~ .315")	1.0 ~ 3.5mm (.039 ~ .138")
Panel Cutouts:	(12.3) Dia .484	(12,3) Dio	(I.2.)R 047 (I.2.3) Dia 

Bushing Mounting/Solder Lug Terminals

(160) Sq. (160) S



T32

KB05KW01-05-FF Model Shown

# NKK SERIES YB

## SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

## **DISTINCTIVE FEATURES**

Bright, full face or spot illumination with incandescent \_ lamps or multi-element LEDs, with or without resistors.

Front panel relamping.

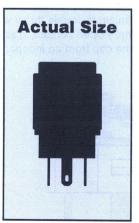
Combination bezel-barrier is an integral part of the switch and prevents accidental actuation.

Unique, patented seal inside caps for added protection to interior mechanism.

Dust and oil tight as well as splashproof. \_\_\_\_ Panel seal models qualify to IP65 of IEC529 Standards (similar to NEMA 4 and 13).

High density design to give behind panel depth of less than one inch.

Distinctive design of snap-action contacts for \_\_\_\_\_shock resistance, long life, and sensitive actuation.



Latchdown for indication of circuit status, plus audible, tactile feedback with smooth, responsive operation.

Tin-lead plated terminals are epoxy sealed to lock out flux, dust, solvents, and other contaminants.

UL recognized.

## **DKK**®

## **SERIES YB PUSHBUTTON SWITCHES**

## SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

## **APPLICATIONS**

YB Series is constructed for quality performance, giving the user assurance of reliable functioning and long life. Components are factory assembled, which greatly simplifies ordering and field installation. In fact, the only complicated thing about YB is choosing which of the expansive number of combinations to use.



These pushbuttons have a built-in bezel-barrier and choice of four cap styles of various colors. Lamps include incandescent 5, 12, and 28-volt as well as LEDs in red, green, and yellow single color, plus red/green bicolor. LEDs are available with built-in resistor or without. Lamp displays can be single color or bicolor with bright, full face or spot illumination. All cap styles are available in square, round, and rectangular shapes and can accommodate inscriptions.



The fine appearance of YB switches is joined with a broad array of functional characteristics: panel sealed or nonsealed versions, momentary and alternate action circuits, snap-acting contacts and sensitive operation, bushing or snap-in mounting, tin-lead plated solder lug/.110" quick connect terminals, plus a seal in the caps for additional protection from intruding liquids.

Compact size, aesthetic design, and safety barriers make YB Series ideal for creating control panels that are attractive and suited to numerous settings. The YB Series is suited to such applications as test instruments, monitoring equipment, process controllers, and computer peripherals.

#### **EASY ORDERING & FACTORY ASSEMBLY**

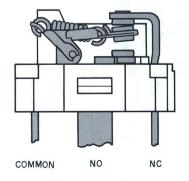
NKK's simple, straightforward ordering system helps you easily order a totally assembled YB switch or single components. No need to search in circles from one footnote to another. No need to wonder if you have built the right part number for a complete device. No hassle at all with NKK's ordering.

The YB ordering number is uncomplicated and includes all features needed to specify the desired switch. Circuitry, panel seal, mounting type, contact material, terminals, lamp type and color, cap style and color -- all are included in the ordering codes used to build a single part number for a YB switch.

A YB pushbutton includes caps, lamps, and mounting nut or snap-in frame. The combination bezel-barrier is an integral part of the switch. Replacement caps and lamps can also be ordered without any complications with part numbers.

#### **SNAP-ACTING MECHANISM**

The snap-acting contact mechanism in the YB pushbutton provides long electrical life and pronounced sensitivity, along with patented shock resistent design. The contact mechanism is double throw with a normally closed and normally open contact. Tactile feedback is transmitted to the cap from an independent latchdown mechanism.



## **GENERAL SPECIFICATIONS**

**Electrical Capacity:** (Resistive Load)

3A @ 125/250V AC & 3A @ 30V DC for silver 0.4VA maximum @ 28V AC/DC maximum for gold (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Contact Resistance:

50 milliohms maximum for silver 100 milliohms maximum for gold

Insulation Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life:

1,000,000 operations minimum for momentary action 200,000 operations minimum for alternate action

**Electrical Life:** 

100,000 operations minimum

Pretravel:

1.5mm (.059")

Overtravel:

1.5mm (.059")

**Total Travel:** 

3.0mm (.118")

**Ambient Temp Range:** 

Illuminated: -25°C through +50°C (-13°F through +122°F) Nonilluminated: -25°C through +70°C (-13°F through +158°F)

**Nominal Operating Force:** 

Nonsealed

Sealed

Single pole

150 grams

170 grams

Double pole

280 grams

300 grams

MATERIALS & FINISHES			
Housing/Bezel	Glass fiber reinforced polyamide		
Snap-in Frame	Stainless steel		
Movable Contactor	Silver alloy or copper with gold plating over nickel		
Movable Contact	Silver alloy or copper with gold plating over nickel		
Stationary Contacts	Silver alloy or copper with gold plating over nickel		
Power Terminals	Phosphor bronze with tin-lead plating		
Lamp Terminals	Phosphor bronze with tin-lead plating		
Base	Diallylphthalate resin		

## **PANEL SEAL CONSTRUCTION**

The YB panel seal device includes three rubber seals that protect the contact mechanism from oil, dust, water, and other contaminants which could otherwise enter from the front panel.

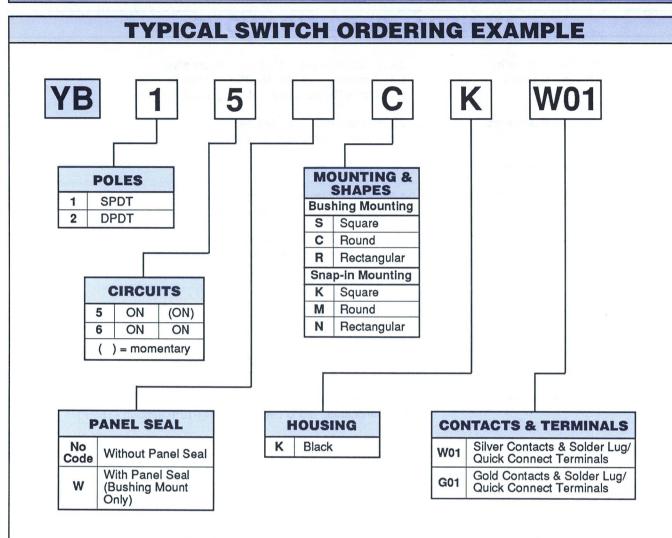
The interior seal is a rolled sleeve of nitrile butadiene rubber covering the joining of the housing and the inner case.

The exterior nitrile butadiene rubber o-ring (AT089 provided w/panel seal model) is positioned between the built-in bezel and the panel when the switch is mounted.

A seal of thermoplastic elastomer inside the caps further protects the interior.



## SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

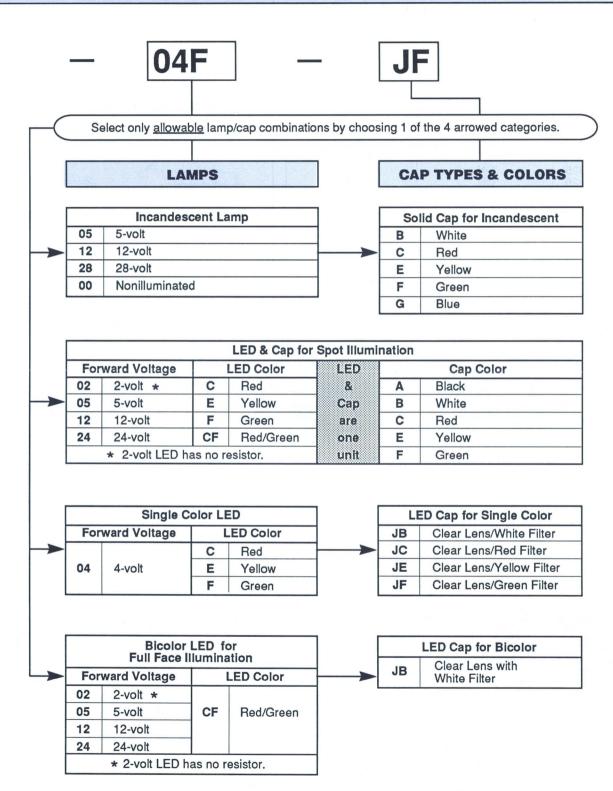


## DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (YB15CKW01-04F-JF):

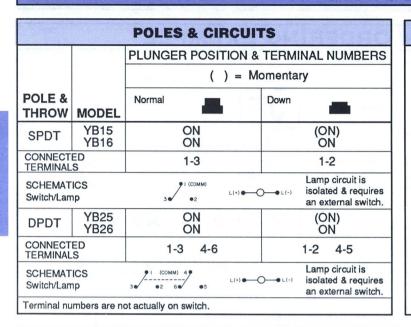
#### **SERIES YB PUSHBUTTON**



### AND ASSEMBLY ORDERING EXAMPLE



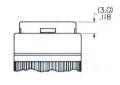
### **BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT**



### **LATCHDOWN DIMENSION**

The latchdown feature on alternate action circuits provides visible, audible, and tactile feedback. Smooth and responsive operation is achieved with the design of this mechanism.

From normal position to latchdown position is 2.5mm (.098").





Normal Position

Latchdown Position

#### **PANEL SEAL**

### No Code

Without Panel Seal

Bushing Mounting

Supplied with mounting nut.



Snap-in Mounting



With Panel Seal W

Mounting

**Bushing** 

Supplied with mounting nut & o-ring.



#### **MOUNTING TYPES & SHAPES**

#### **Bushing Mounting**









Rectangular



**CONTACTS & TERMINALS** 











#### HOUSING



**Black** 

The 1-piece body and bezel-barrier have a black matte finish.

Silver Contacts & Tin-lead plated Solder Lug/.110" **QC Terminals** 

W01

### G01

**Gold Contacts &** Tin-lead plated Solder Lug/.110" **QC Terminals** 



**Typical** mating connector **AMP** #42068-1 (reel) #42470-1 (loose piece)

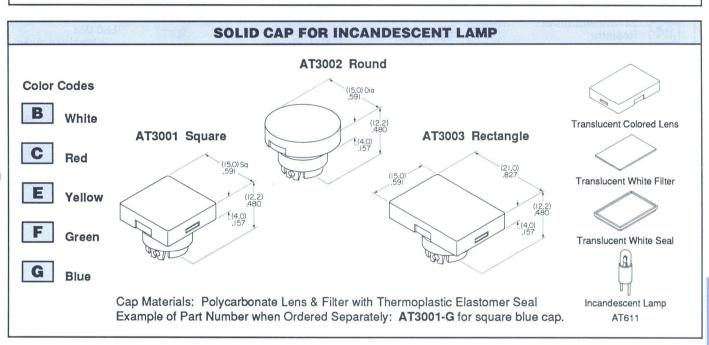


# **UKK**®

### **SERIES YB PUSHBUTTON SWITCHES**

### SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

#### **INCANDESCENT LAMP** AT611 **Used with Solid Cap Specifications** (3.1) Dia **Lamp Codes** 05 12 28 **Lamp Codes** (3.8) Dia (9.0)Voltage 5V 12V 28V 05 5-volt (12.6) (0.5) Dia Typ Current 115mA 60mA 24mA 12-volt MSCP .150 .150 .150 T-1 Standard Bi-pin Endurance Hours 7,000 7,000 7,000 28 28-volt Example of Part Number Ambient Temp Range -25°C ~ +50°C when Ordered Separately: 00 AT611-28V for 28-volt lamp No Lamp



### **COMPONENT ORDERING WITH "AT" NUMBERS**

Lamps & caps can be ordered separately from the switch. Part numbers preceded by "AT" are used for this purpose. The following examples illustrate the difference between ordering a complete switch assembly or a lamp or cap replacement.

Assembled Switch Part Number	Separate Component Part Number	Description of Component
YB15KSKW01- <u>12-C</u>	AT611- <i>12V</i> AT3001- <u>C</u>	12-volt incandescent lamp Square, red solid cap
YB15CKW01- <u>04E-JE</u>	AT620E- <u><i>04</i></u> AT3005 <u><i>JE</i></u>	Yellow, 4-volt LED Round LED cap with yellow diffuser
YB15RKW01- <u>02CFA</u>	AT3012 <i>ACF-02</i>	Rectangular, black spot illuminated cap with red/green, 2-volt bicolor LED
YB15SKW01- <i>05CF-JB</i>	AT621 <i>CF-05</i> AT3004 <u>JB</u>	Red/green, 5-volt bicolor LED Square LED cap with white diffuser

nkk° \_**s**witches

Single

Color

**Bicolor** 

## **NKK** SERIES YB PUSHBUTTON SWITCHES

### SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

#### SPOT ILLUMINATED CAP WITH BUILT-IN LED

This spot-illuminated cap is a 1-piece assembly. The parts -- LED & cap -- are not available separately. Choose voltage, LED color, & insert color in any desired combination. Make selections using the 3 steps below.

Step 1: **LED Voltage Codes**  Step 2: **LED Color Codes** 

2-volt 02 w/o Resistor

Red

5-volt w/built-in 05 Resistor

Yellow

12-volt w/built-in 12 Resistor

Green

24-volt w/built-in 24 Resistor

Red/Green

Step 3:

**Insert Color Codes** 

Black

White

Yellow

Green



Colored Insert

Seal

**LED Unit** (integral part of cap)

(15.0) Dia

(8.8)

#### **Specifications**

**LED Voltage Codes** 02 05 12 24 w/o Resistor with Resistor Forward Peak Current 20 15 15 12mA Continuous Fwd Current 10mA 15 12.5 12.5 Forward Voltage 2.1 5 12 24V  $V_{RM}$ Reverse Peak Voltage 5 5 (Reverse peak voltage not applicable to bicolor.) **Current Reduction Rate** 0.27 -----Above 25°C mA/°C

Ambient Temperature Range -25°C ~ +50°C If the source voltage exceeds rated voltage, a ballast

resistor is required; this resistor value can be calculated by using formula in Supplement at the end of this catalog.

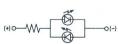
### **Schematics**

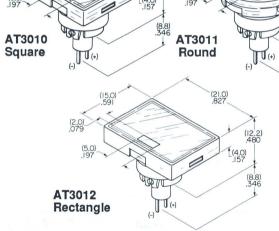
Without Resistor 2-volt

With Resistor 5, 12, & 24-volt





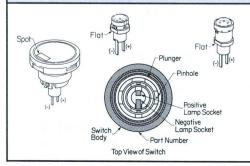




Materials: Polycarbonate with Thermoplastic Elastomer Seal

Example Part Number when Ordered Separately: AT3010AF-02 for black cap with green 2-volt LED

### **LED ORIENTATION & CAP REPLACEMENT**



### **LED Orientation**

Terminals are identified on drawings. Negative LED terminal is on side with flat or on side with spot.

Negative side of socket is on same side as the part number.

# Grip Slot ABSA E Projections

#### Cap Replacement

Match prongs on base with projections in switch.

Prongs are on same side as the grip slots.

Press firmly in place.

### **BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT**

#### SINGLE COLOR LED **BICOLOR LED** Bicolor LED used for Full Face Illumination **AT620** Single Color LED used for Full Face Illumination AT621 **LED Voltage Code LED Color Codes LED Color Code LED Voltage Codes** 2-volt 4-volt 04 CF C w/o Resistor Red/Green w/o Resistor Red 5-volt w/built-in Yellow Resistor 12-volt w/built-in Green Resistor Example of Part Number when 24-volt w/built-in Ordered Separately: AT620C for red 4-volt LED. Resistor **Specifications Specifications LED Color Codes LED Voltage Codes** 02 12 24 C E E 05 Forward Peak Current Forward Peak Current 60 60 20 12mA 40mA 40mA 40mA Continuous Fwd Current Continuous Fwd Current 45 45 10mA 30mA 30mA 30mA 2.1 5 24V Forward Voltage 3.9V 3.9V 4.2V Forward Voltage 12 V<sub>RM</sub> $V_{\rm RM}$ Reverse Peak Voltage 8V Reverse Peak Voltage Not applicable to bicolor 8V 8V **Current Reduction Rate** $\Delta I_{F}$ **Current Reduction Rate** 0.8 0.50 0.50 0.50 mA/°C Above 25°C mA/°C Above 25°C mA/°C mA/°C Ambient Temp Range -25°C ~ +50°C Ambient Temp Range -25°C ~ +50°C

If the source voltage exceeds rated voltage, a ballast resistor is required; this resistor value can be calculated by using the formula in the Supplement at the end of this catalog.

#### Schematics for Single & Bicolor LEDs

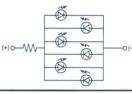
AT620 Single Color LED with 4 Elements 4-volt w/o Resistor





(X)

AT621 Bicolor LED AT621 Bicolor LED with 6 Elements with 6 Elements 5-volt with Resistor



AT621 Bicolor LED with 6 Elements 12 & 24-volt w/Resistor

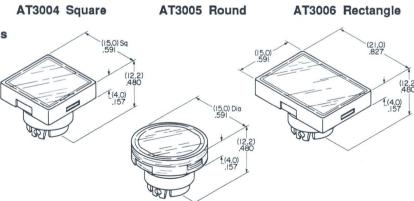


#### LED CAP FOR SINGLE OR BICOLOR FULL FACE ILLUMINATION



Clear/Green JF for AT620

for AT620



Transparent Clear Lens

Translucent Colored Filter



Translucent White Seal



Cap Materials: Polycarbonate Lens & Filter with Thermoplastic Elastomer Seal Example of Part Number to Order Separately: AT3005JC for round, red cap.

Single or Bicolor LED AT620 or AT621

### SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

#### **INSCRIPTIONS**

Several legending methods are available: pad printing, hot stamping, engraving, and film insertion.

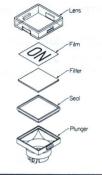
- · Pad printing is a preferred method for its long life and is done on the lens or the filter.
- Engraving is limited to a depth of 3.0mm (.021") or less and requires enamel paint for coloring.
- Film inserted between the lens and filter should be adhesive to stay in place on the filter and can have a maximum thickness of 0.1mm (.004").

Contact factory for further details about legending.









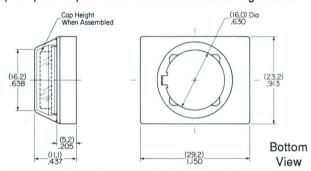


AT4115 Splash Cover for Square, Round, & Rectangular

Polyvinyl Chloride Lid:

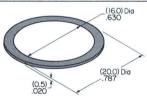
Base: Polyamide Achieves splashproof on bushing

mount model w/o o-ring AT541; achieves splashproof & panel seal if combined with o-ring AT541.



AT541 O-ring for Panel Seal with Splash Cover

Nitrile butadiene rubber

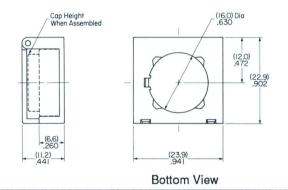


AT4072 Protective Guard for Square, Round, & Rectangular

Lid: Polycarbonate

Base: Glass Fiber Reinforced

Polycarbonate



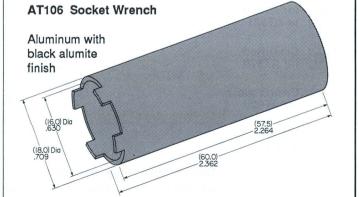
AT107 Lamp Extractor

Polyvinyl chloride



#### AT105 Cap Removal Tool

Stainless steel

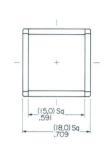


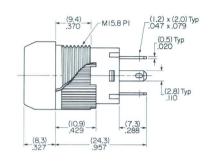
T42

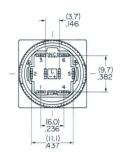
### BODY/SNAP ACTION/BUSHING & SNAP-IN MOUNT

#### Square/Bushing Mount/Single & Double Pole









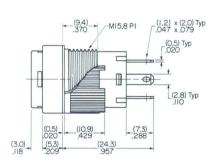
YB15SKW01-28-C Model Shown

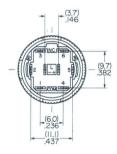
Single pole models do not have terminals 4, 5, & 6.

#### Round/Panel Seal/Single & Double Pole







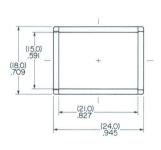


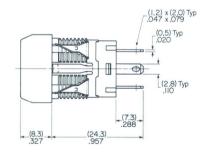
YB25WCKW01-12-E Model Shown

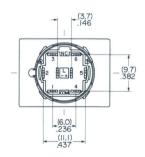
Single pole models do not have terminals 4, 5, & 6.

### Rectangular/Snap-in Mount/Single & Double Pole









YB15NKW01-04C-JC Model Shown

Single pole models do not have terminals 4, 5, & 6.

#### **MOUNTING SPECIFICATIONS**

Soldering Time & Temperature Limits 3 seconds at 350°C & 5 seconds at 270°C

Maximum Mounting Force: 8kg/cm

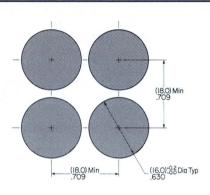
### Wiring Specifications

Solder lug terminal hole is .047" X .079" & accommodates one solid 18-gauge wire or two solid or stranded 20-gauge wires.

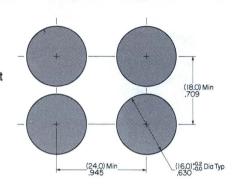
### SHORT BODY/SNAP ACTION/BUSHING & SNAP-IN MOUN

#### MAX EFFECTIVE PANEL THICKNESS & CUTOUTS FOR SINGLE OR MULTIPLE MOUNTING

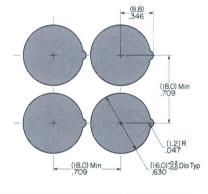
**Bushing &** Panel Seal Mount for Square or Round 0.5mm ~ 5.0mm  $(.020" \sim .197")$ 



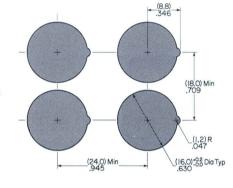
**Bushing &** Panel Seal Mount for Rectangular 0.5mm ~ 5.0mm  $(.020" \sim .197")$ 



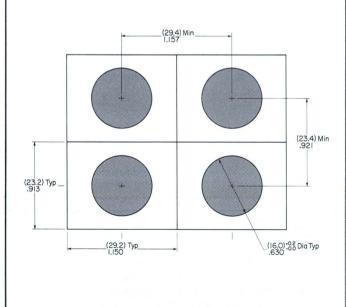
Snap-in Mount for Square or Round 1.0mm ~ 3.5mm  $(.039" \sim .138")$ 



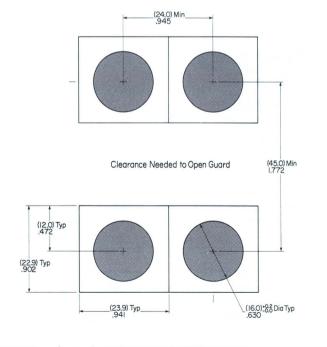
Snap-in Mount for Rectangular 1.0mm ~ 3.5mm  $(.039" \sim .138")$ 



Square, Round, or Rectangular with Splash Cover 0.5mm ~ 3.8mm (.020" ~ .150") for Bushing & Panel Seal 0.5mm ~ 2.3mm (.020" ~ .091") for Snap-in



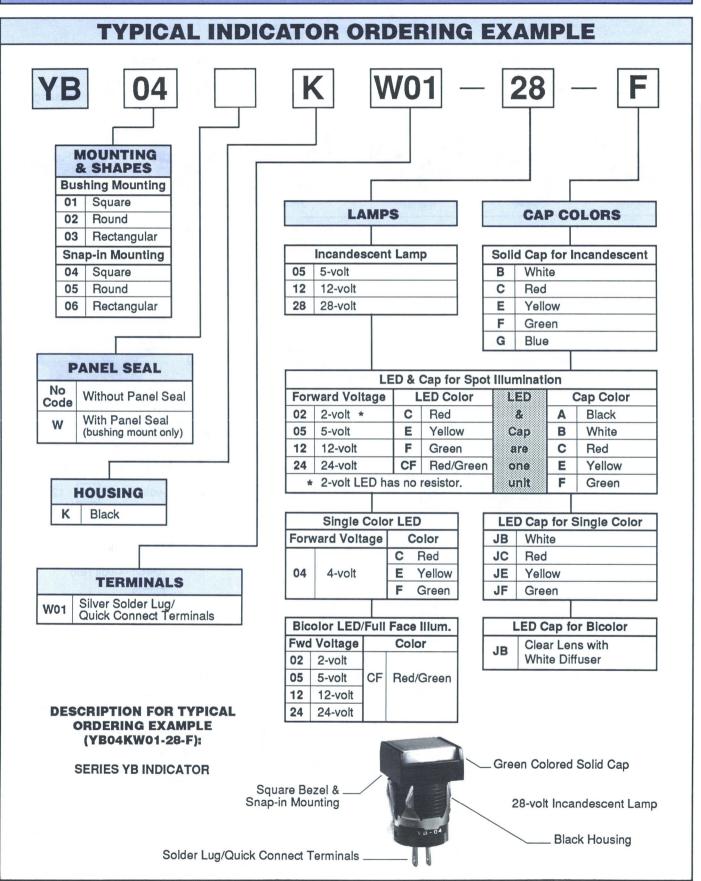
Square, Round, or Rectangular with Protective Guard 0.5mm ~ 3.8mm (.020" ~ .150") for Bushing & Panel Seal 0.5mm ~ 2.3mm (.020" ~ .091") for Snap-in



# **DKK**®

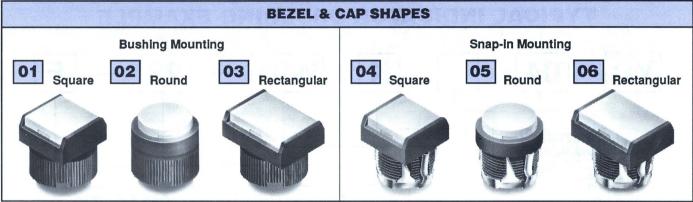
## **SERIES YB INDICATORS**

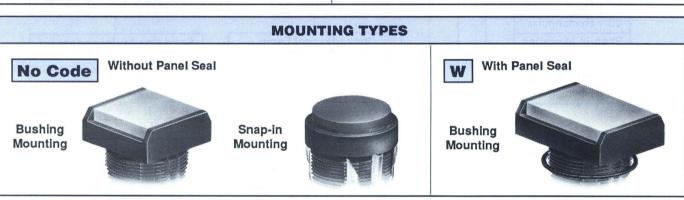
### SHORT BODY/BUSHING & SNAP-IN MOUNT



## **SERIES YB INDICATORS**

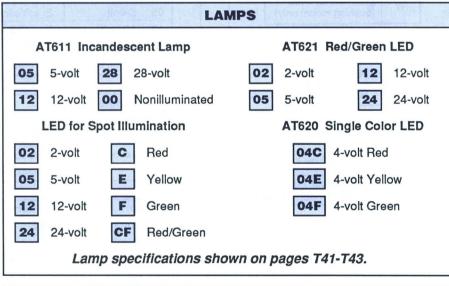
### SHORT BODY/BUSHING & SNAP-IN MOUNT













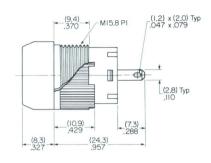
# **KK** SERIES YB INDICATORS

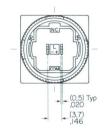
### SHORT BODY/BUSHING & SNAP-IN MOUNT

### Indicator/Square/Bushing Mount







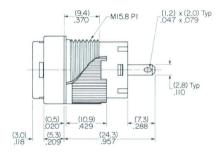


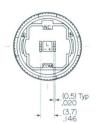
YB01KW01-28-C Model Shown

#### Indicator/Round/Panel Seal





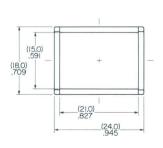


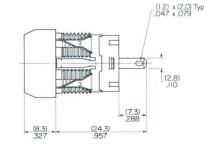


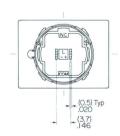
YB02WKW01-28-C Model Shown

### Indicator/Rectangular/Snap-in Mount

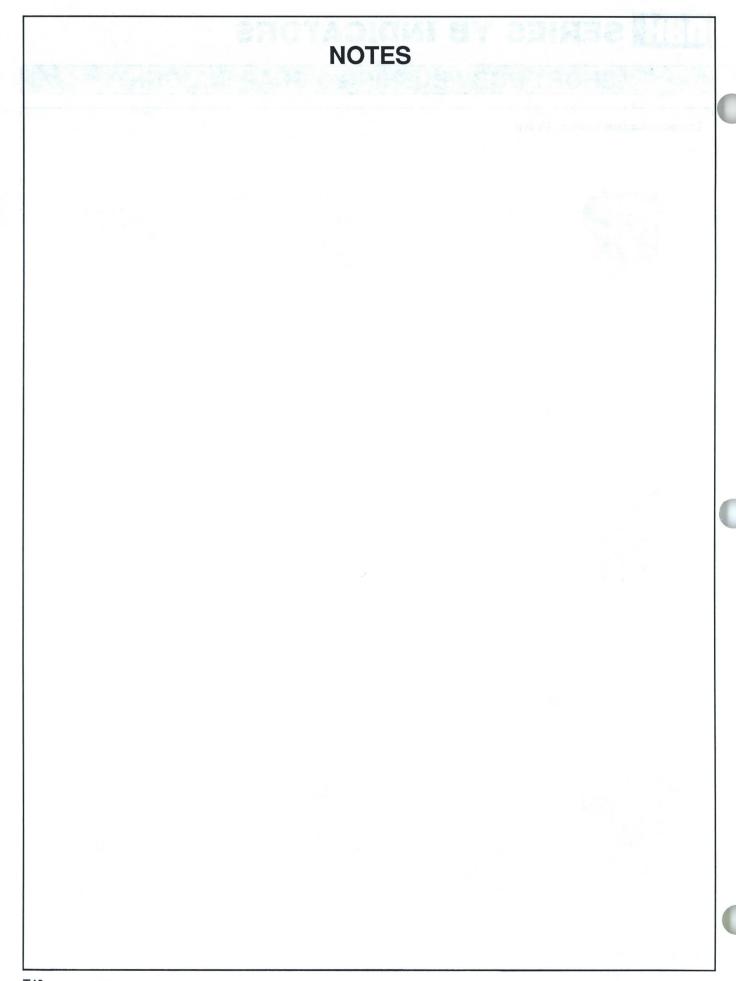








YB06KW01-28-C Model Shown



# SERIES LB

### STANDARD SIZE/SNAP-IN & REAR PANEL MOUNTING

### **DISTINCTIVE FEATURES**

Carefully designed light diffusion and filtering system. produces bright, full surface illumination.

Convenient relamping and cap changing from front of panel.

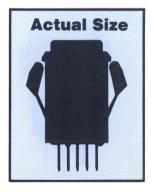
Spot illumination available in single and bicolor LEDs.

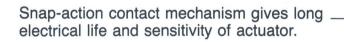
Correct LED polarity and cap orientation assured by molded guides.

Panel sealed model meets IP 65 of IEC 529 specifications (similar to NEMA 4 & 13).

> Stainless steel clips provide secure mounting with a wide range of panel thicknesses.

> > Latchdown feature gives indication of circuit status. Audible and tactile feedback with smooth and responsive operation.





Combination solder lug and .110" quick connect. terminals are epoxy sealed to prevent entry of flux, dust, and other contaminants.

Compact switch design minimizes behind panel depth.

# NKK SERIES LB

### STANDARD SIZE/SNAP-IN & REAR PANEL MOUNTING

### **APPLICATION DATA**

LB devices are power and logic-level rated and are available with single or double pole and maintained or momentary circuits. Models rated 3 amps @ 125/250V AC and 0.4VA @ 28V AC/DC maximum are UL recognized and CSA certified. These standard size switches have solder lug/.110" quick connect terminals; straight PC terminals are available on the optional adaptor. Matching indicators are also offered.

Front Panel appearance can be enhanced with the wide selection of cap styles, illumination types, and accessories.

Black or Gray
Built-in Bezel

Square
Round
Rectangular

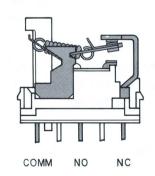
Barriers
Splash Covers
Dustcovers

Dustcovers

#### **SNAP-ACTION MECHANISM**

NKK's LB switch is designed with a single break snap-action contact mechanism. The combined butterfly formation and spring action of the movable

contact create the quick-make, quick-break characteristic which limits arcing and prolongs electrical life. Sensitivity of actuation is an additional result of this design. The switch is offered with momentary or maintained circuits in single or double pole configurations.



#### **PANEL SEAL MODEL**

A new dimension has been added to the LB Series with the development of the industrial control version which is oil, dust, and watertight. By means of exte-

rior and interior rubber seals, contaminants are prevented from entering at the front of the panel. The panel seal model is qualified to IP 65 of IEC 529 standards (similar to NEMA 4 & 13).



### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION

### **GENERAL SPECIFICATIONS**

With Silver Contacts for Power Circuits

With Gold Contacts for Logic Level Circuits

Electrical Capacity: (Resistive Load)

3A @ 125V AC 3A @ 250V AC 3A @ 30V DC 0.4VA maximum @ 28V AC/DC max (Applicable Range 0.1mA  $\sim$  0.1A @

20mV ~ 28V)

Contact Resistance:

50 milliohms maximum

100 milliohms maximum

Insulation Resistance:

200 megohm minimum @ 500V DC

200 megohm minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts 1,500V AC min between contacts & case

1,000V AC minimum between contacts 1,500V AC min between contacts & case

Mechanical Life:

1,000,000 operations min for momentary 200,000 operations min for maintained

1,000,000 operations min for momentary 200,000 operations min for maintained

Electrical Life:

100,000 operations minimum

100,000 operations minimum

Ambient Temp Range:

Illuminated: -25°C through +50°C (-13°F through +122°F)
Nonilluminated: -25°C through +70°C (-13°F through +158°F)

Note: When used with a polyvinyl chloride splash cover, the lowest limit is 0°C (32°F).

Nominal Operating Force:

450 grams

450 grams

Travel:

For Momentary Circuits:

For Maintained Circuits:

Pretravel 1.9mm (.075") Overtravel 1.1mm (.043") Total Travel 3.0mm (.118") Pretravel 2.2mm (.087") Overtravel 0.8mm (.031") Total Travel 3.0mm (.118")

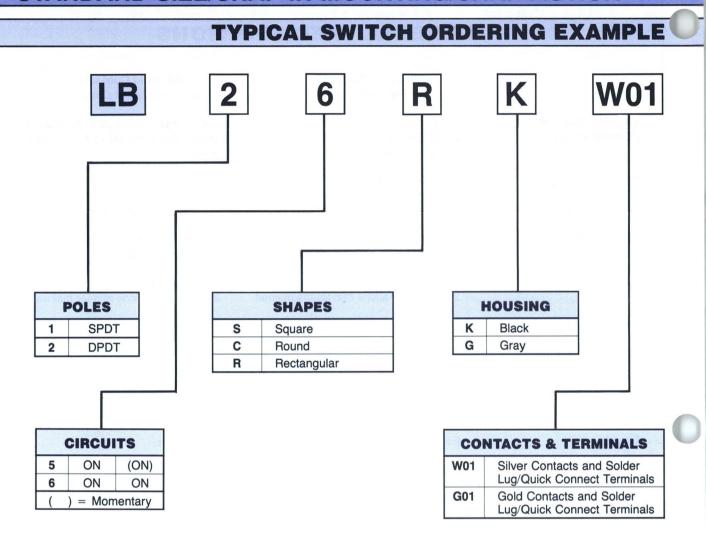
MATERIALS & FINISHES				
Housing	Glass fiber reinforced polyamide (94V-1 UL Flammability Rating)			
Snap-in Frame	Stainless steel			
Movable Contact	Silver alloy or Copper with gold plating over nickel plating			
Stationary Contacts	Silver alloy or Copper with gold plating over nickel plating			
Base	Diallylphthalate (94V-0 UL Flammability Rating)			
Common Terminals	Phosphor bronze with silver or gold plating			
End Terminals	Phosphor bronze with silver or gold plating			
Lamp Terminals	Phosphor bronze with silver plating			

#### UL & CSA

LB switches are recognized by Underwriters Laboratories Inc. at the following rating:
3 amps @ 125V or 250V AC 0.4VA @ 28V AC/DC UL File No. E44145

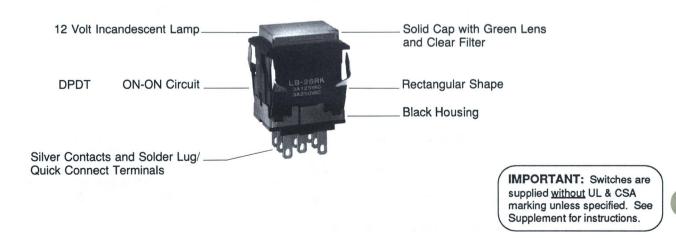
LB switches are certified by
Canadian Standards Association
at the following ratings:
3 amps @ 125V or 250V AC and
0.4VA @ 28V AC/DC max
CSA File Nos. LR 23535 and LR56017

### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION



### **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (LB26RKW01-12-FJ):**

#### SERIES LB PUSHBUTTON



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## **AND ASSEMBLY ORDERING EXAMPLE**

### **LAMPS**

# CAP TYPES & COLOR COMBINATIONS

Incandescent Lamp used with Solid Cap		
00	No Lamp	
05	5-volt	
12	12-volt	
28	28-volt	

	Solid Cap Lens/Filter Colors
BJ	White with Clear
CJ	Red with Clear
EJ	Yellow with Clear
FJ	Green with Clear
GJ	Blue with Clear

Incandescent or Neon Lamp used with Insert Cap		
00	No Lamp	
01	110-volt Neon	
05	5-volt Incandescent	
12	12-volt Incandescent	
28	28-volt Incandescent	

Insert Cap Lens/Filter Colors			
JB	Clear with White		
JC	Clear with Red		
JE	Clear with Yellow		
JF	Clear with Green		
JG	Clear with Blue		
Note	: JF & JG not available w/neon.		

Single Element LED used with Single Element LED Cap			
10	Single Element		

_	Cap for Single Element LED Diffuser/LED Colors				
	CC Red with Red LED				
	EE Yellow with Yellow LED				
	FF Green with Green LED				
	BC White with Red LED				
	BE White with Yellow LED				
	BF	White with Green LED			
	-				

LED used with Spot Illuminated Cap		
1C	Red Single Color	
1E	Yellow Single Color	
1F	Green Single Color	
CF	Red/Green Bicolor	

	Spot Illumi Cap C	nated Cap olors
Α	Black	Available
В	White	in square
С	Red	and round
F	Green	only.

Nonilluminated Cap		
00	No Lamp is Included	

Nonilluminated Cap Cap Colors						
A	В	С	E	F	G	Н

Color Codes:

A Black

**B** White

C Red E Yellow

F Green

G Blue

J Clear



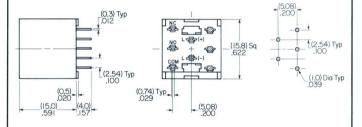
### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION

POLES AND CIRCUITS				
		PLUNGER POSITION 8	TERMINAL NUMBERS	
		( )=	Momentary	
		Normal	Down	
POLE & THROW	MODEL			
SPDT	LB15 LB16	ON ON	(ON) ON	
CONNECTED TERMINALS		1-3	1-2	
SCHEMATICS Power/Lamp		1 (COMM)	L(+) ●────── (-) L	
DPDT	LB25 LB26	ON ON	(ON) ON	
CONNECTED TERMINALS		1-3 4-6	1-2 4-5	
SCHEM Power		3 • 1 (COMM) 4 • 5	L(+) • (-) L	

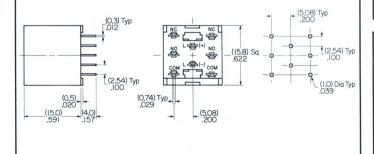
Terminal numbers are not actually on the switch but labels are (NC, NO, COM, L+, L-). Lamp circuit is isolated and requires an external switch.

### **OPTIONAL PCB ADAPTORS**

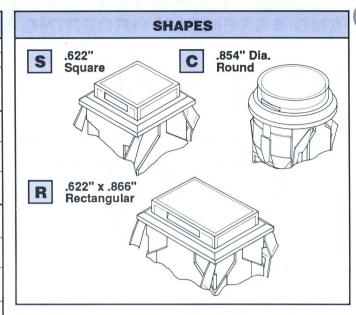
AT711 Single Pole Straight PC Terminals



AT712 **Double Pole** Straight PC Terminals



Note: Adaptors ordered separately.



#### HOUSING

K Black

G Grav

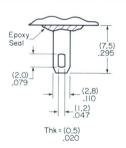
### RATING, CONTACT MATERIAL **AND TERMINAL TYPES**

**W01** 

Power Circuit (3A) Silver Contacts Solder Lug/Quick **Connect Terminals** 

**G01** 

Logic Level Circuit (0.4VA) **Gold Contacts** Solder Lug/Quick **Connect Terminals** 



Typical mating connector AMP #687954-2

#### WIRING AND SOLDERING

The solder lug/quick connect terminals have a .047" x .079" oblong hole which accommodates one solid 18-gauge wire or two solid or stranded 20-gauge wires.

Soldering time and temperature limits:

3 seconds @ 350°C 5 seconds @ 270°C

T54



### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION

#### LAMPS

The lamp circuit is independent of the switching operation. Dimension drawings of lamps and LEDs are in the accessories section at the end of this catalog. The electrical specifications shown below are determined at a basic temperature of 25°C. If the source voltage exceeds rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula at the end of this catalog.

Incandescent Lamp							
05	AT607			ELEC	CTRICAL SPECIF	FICATIONS	
12 12 Volt	Colored and	Used with Solid Colored and	Voltage	V	5V AC	12V AC	28V AC
12 Voit			Current	1	115mA	60mA	24mA
28 <sub>28 Volt</sub>	1		Endurance	Hours		7,000 average	

Neon Lamp				
O1 110 Volt  Used with	ATCOZNI	ELECTRICAL SPECIFICATIONS		
	AIOU/N	Voltage	V	110V AC
		Current	1	1.5mA
		Endurance	Hours	10,000 average
Colored Insert Cap	T-1 Standard Bi-pin	Recommended Resistors: 33K ohms for 110V AC 100K ohms for 220V AC		

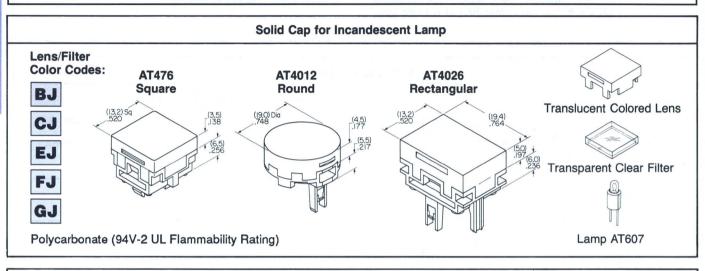
Single Element LED						
		ELECTRICAL SPECIFICATIONS				
10 Single Element	AT614			Red	Yellow	Green
	A1014	Forward Peak Current	$I_{\text{FM}}$	50mA	50mA	50mA
		Continuous Forward Current	Ι <sub>Ε</sub>	40mA	40mA	40mA
	T-11/2 Cylindrical	Forward Voltage	$V_{F}$	1.75V	2.35V	2.35V
*		Reverse Peak Voltage	$V_{RM}$	4V	4V	4V
Used with LED Cap		Current Reduction Rate Above 25°C	$\Delta I_{F}$	0.67mA/°C	0.67mA/°C	0.67mA/°C

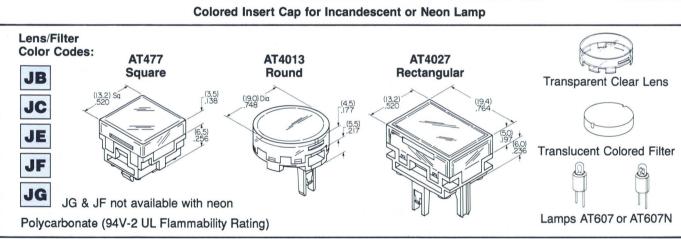
	LED For Spot Illuminated Caps						
	1	E	ELECTRICAL SPECIFICATIONS				
1C	Red Single Color				Single Color		Bicolor
1E				Red	Yellow	Green	Red/Green
	Yellow Single Color  Green Single Color	Forward Peak Current	I <sub>FM</sub>	10mA	20mA	30mA	50mA
		Continuous Forward Current	I <sub>F</sub>	8mA	16mA	24mA	25mA
CF	Red/Green Bicolor	Forward Voltage	$V_{F}$	1.9V	1.9V	2V	2V
	LED factory assembled	Reverse Peak Voltage	$V_{RM}$	5V	4V	5V	_
	in Spot Illuminated Caps; Not Available Separately	Current Reduction Rate Above 25°C	$\Delta I_{F}$	0.13mA/°C	0.27mA/°C	0.40mA/°C	0.67mA/°C

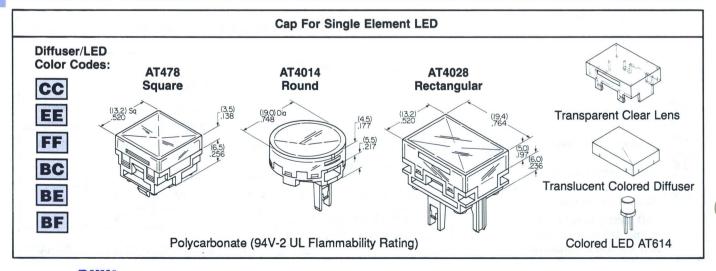
### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION

#### **CAP TYPES & COLOR COMBINATIONS**

Color Codes: A Black B White C Red E Yellow F Green G Blue H Grav J Clear



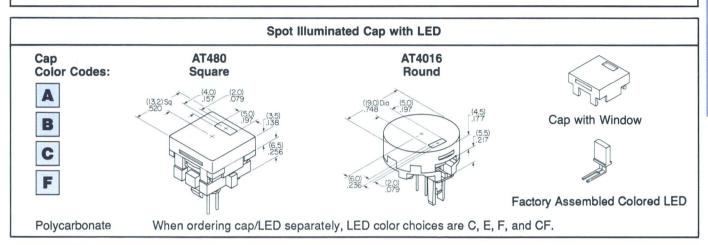


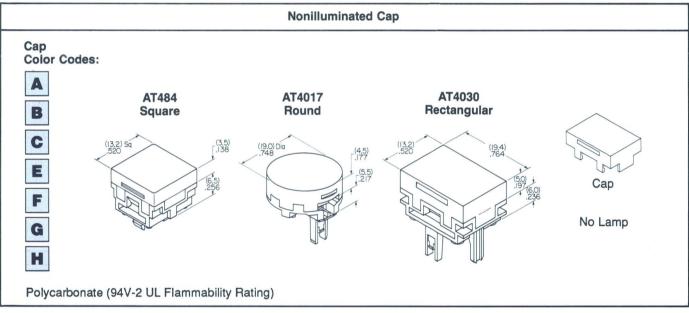


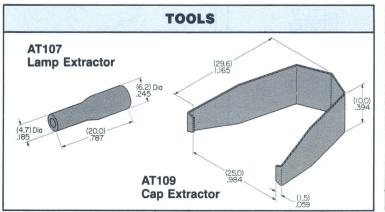
### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION

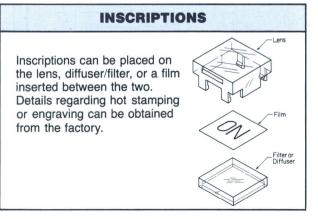
#### **CAP TYPES & COLOR COMBINATIONS**

Color Codes: A Black B White C Red F Green G Blue E Yellow **H** Gray J Clear



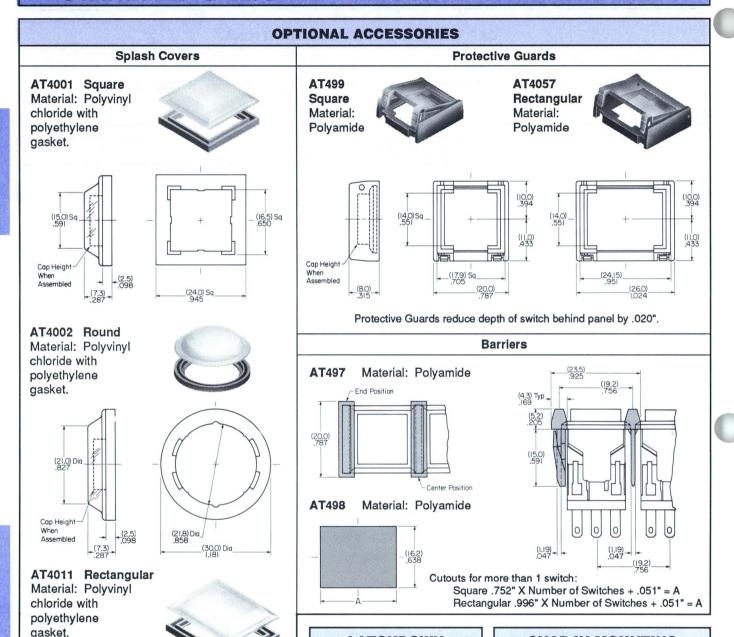


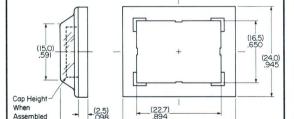




**WITCHES** • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION





Splash Covers reduce depth of switch behind panel by .020". Polyvinyl chloride loses pliability below 0°C (32°F).

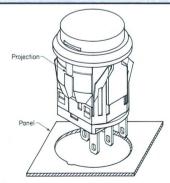
(30.2)

#### **LATCHDOWN**



When cap is latched down for the alternate circuit, it is positioned 1.0mm (.039") above the built-in bezel.

#### **SNAP-IN MOUNTING**

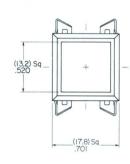


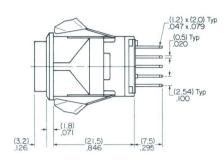
The switch is inserted from the front of the panel & held firmly in place by the stainless steel clip or frame.

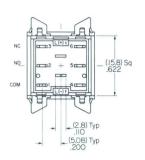
### STANDARD SIZE/SNAP-IN MOUNTING/SNAP ACTION

### Square/Solder Lug/Quick Connect Terminals/1-2 Pole







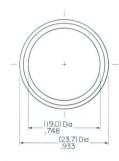


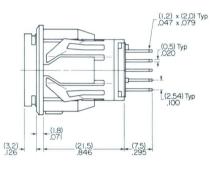
LB15SKW01-28-CJ Model Shown

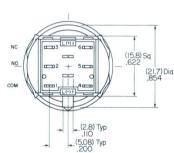
Terminals 4, 5 & 6 are not on single pole models.

#### Round/Solder Lug/Quick Connect Terminals/1-2 Pole







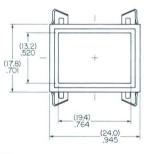


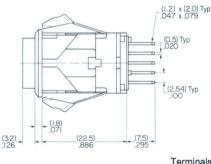
LB16CKW01-28-CJ Model Shown

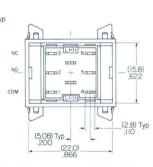
Terminals 4, 5 & 6 are not on single pole models.

#### Rectangular/Solder Lug/Quick Connect Terminals/1-2 Pole









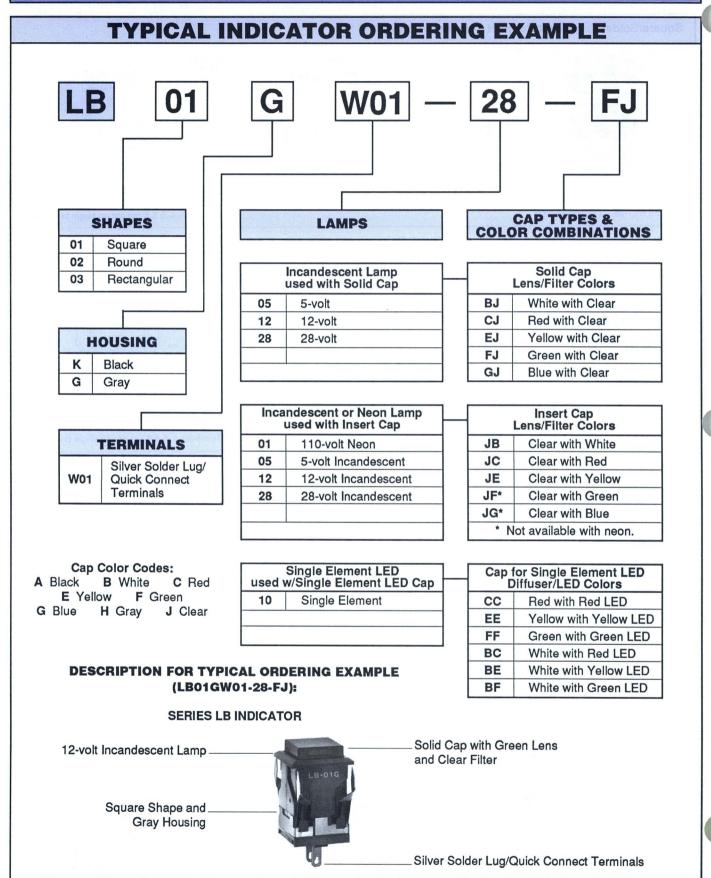
LB26RGW01-28-CJ Model Shown

Terminals 4, 5 & 6 are not on single pole models.

#### **EFFECTIVE PANEL THICKNESS & PANEL CUTOUTS** For Protective Guards & Splash Covers: Panel For Switches & Barriers: Thickness: 1 ~ 3.5mm (.039" ~ .138") 1 ~ 4mm (.039" ~ .157") Cutout for switch is .638" X .638" Cutout for switch is .638" X .882" (22.0) Dia .866 Panel **Cutouts:** Cutout for 1 switch with Cutout for 1 switch with barriers is .638" X .815". barriers is .638" X 1.059".

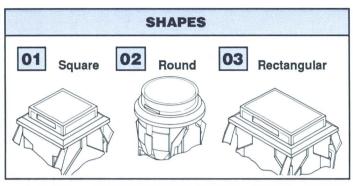
# **NKK** SERIES LB INDICATORS

### STANDARD SIZE/SNAP-IN MOUNTING

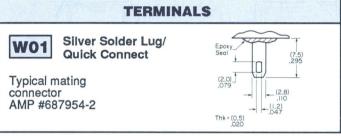


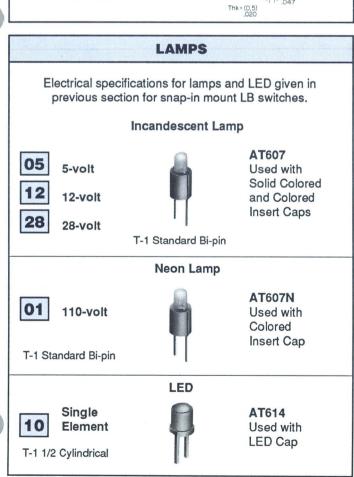
# **NKK®** SERIES LB INDICATORS

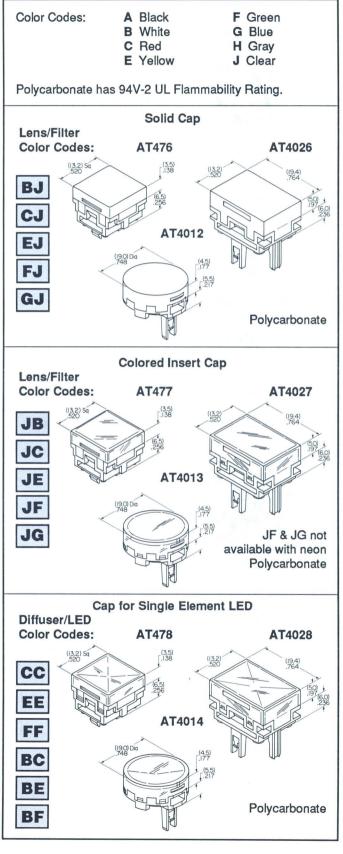
### STANDARD SIZE/SNAP-IN MOUNTING









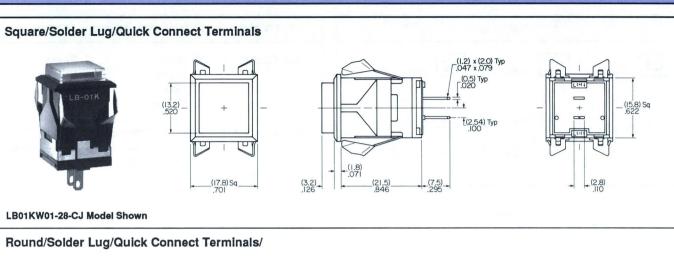


**CAP TYPES & COLOR COMBINATIONS** 

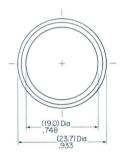


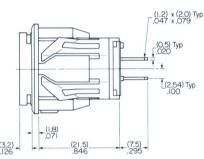
## SERIES LB INDICATORS

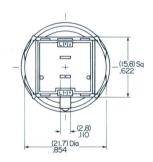
### STANDARD SIZE/SNAP-IN MOUNTING







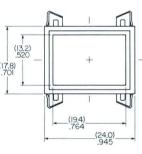


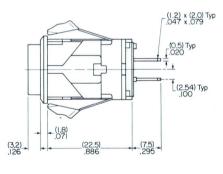


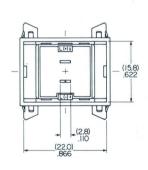
LB02KW01-28-CJ Model Shown

### Rectangular/Solder Lug/Quick Connect Terminals









LB03SKW01-28-CJ Model Shown

Panel Thickness:		1 ~ 4mm (.039" ~ .157")	
Panel Cutouts:	- + (16.2) Sq - (16.2) Sq - (16.3) Sq	(22.0) Dia .866 (11.5) .453 .059	- + (16.2) - (38) - (22.4) 882

T62

### STANDARD SIZE/REAR PANEL MOUNTING/PANEL SEAL

### **APPLICATION DATA**

The LB Panel Seal model features those same fine characteristics found in the snap-in models: snap-action contact mechanism, latchdown on alternate action circuits, epoxy sealed solder lug/.110" quick connect terminals, compact behind panel depth, guides for LED polarity and cap orientation, convenient relamping, bright full surface illumination, momentary and alternate action circuits in single and double pole.





The distinction of the LB Panel Seal switch is found in its unique construction whereby potentially harmful substances are sealed out of the contact mechanism. This model is well suited to industrial control settings where a control panel might be exposed to spraying water or oil or blowing particles such as dust.

#### LATCHDOWN DIMENSION

When the cap is latched down for the alternate action circuit, it is positioned 1.0mm (.039") above the builtin bezel.



#### PANEL SEAL CONSTRUCTION

This device includes two rubber seals that protect the contact mechanism from oil, dust, water, and other contaminants which could otherwise enter from the front panel. The exterior nitrile butadiene rubber o-ring (AT075) is positioned between the built-in bezel and the panel when the switch is mounted. The interior seal is a rolled sleeve of silicone rubber surrounding the innef mechanism.

The Panel Seal model is qualified to IP 65 of IEC 529 standards (similar to NEMA 4 and 13).



### STANDARD SIZE/REAR PANEL MOUNTING/PANEL SEAL

### **GENERAL SPECIFICATIONS**

Silver Contacts for Power Circuit Gold Contacts for Logic Level Circuit

Electrical Capacity: (Resistive Load)

3A @ 125V AC 3A @ 250V AC 0.4VA max @ 28V AC/DC max (Applicable Range: 0.1mA ~ 0.1A @

20mV ~ 28V)

**Contact Resistance:** 

50 milliohms maximum

100 milliohms maximum

Insulation Resistance:

200 megohms minimum at 500V DC

200 megohms minimum at 500V DC

Dielectric Strength:

**Mechanical Life:** 

1,000V AC minimum between contacts

1,000V AC minimum between contacts

1,500V AC minimum between contacts and case

1,500V AC minimum between contacts and case

1,000,000 operations minimum for

1,000,000 operations minimum for

momentary circuits

momentary circuits

200,000 operations minimum for maintained circuits

200,000 operations minimum for maintained circuits

**Electrical Life:** 

100,000 operations minimum

100,000 operations minimum

**Nominal Operating Force:** 

450 grams

450 grams

MATERIALS AND FINISHES			
Housing	Fiberglass reinforced polyamide		
O-ring	Nitrile butadiene rubber		
Inner Seal	Silicone rubber		
Movable Contact	Silver alloy or copper with gold plating over nickel plating		
Stationary Contacts	Silver alloy or copper with gold plating over nickel plating		
Base	Diallylphthalate		
Common Terminal	Phosphor bronze with silver or gold plating		
End Terminals	Phosphor bronze with silver or gold plating		
Lamp Terminals	Brass with silver plating		

#### **AMBIENT TEMPERATURE RANGE**

Illuminated

-25°C through +50°C

(-13°F through +122°F)

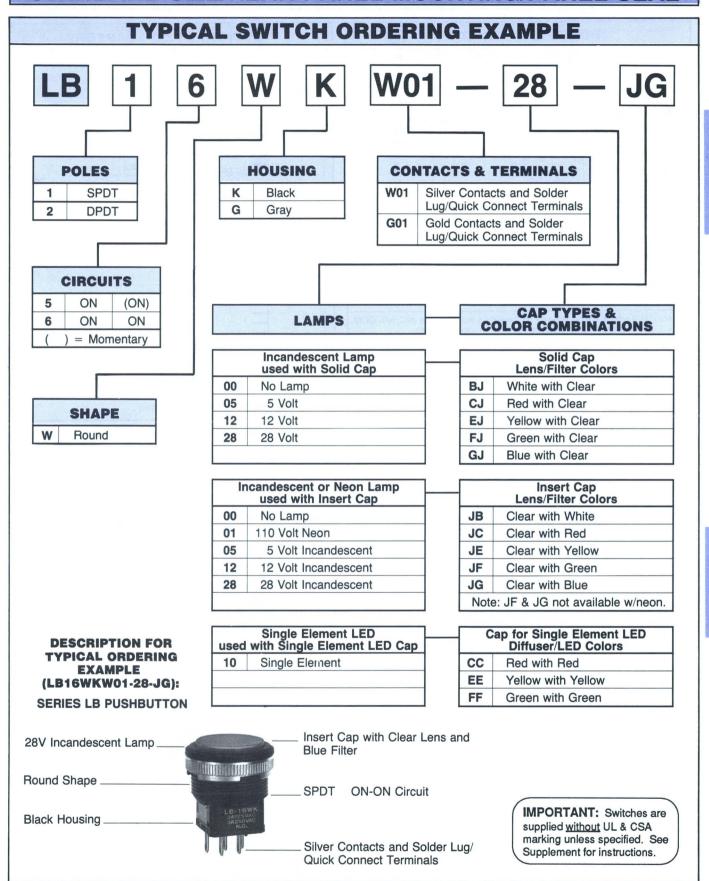
Nonilluminated

-25°C through +70°C

(-13°F through +158°F)

	TRAVEL	
	Momentary	Maintained
Pretravel	1.7mm (.067")	1.6mm (.063")
Overtravel	1.3mm (.051")	0.8mm (.031")
Total Travel	3.0mm (.118")	2.4mm (.094")

### STANDARD SIZE/REAR PANEL MOUNTING/PANEL SEAL

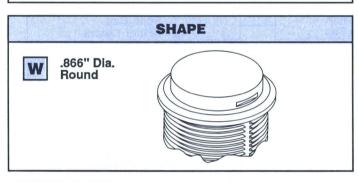


# **NKK**®

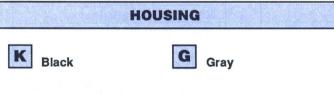
### SERIES LB PUSHBUTTON SWITCHES

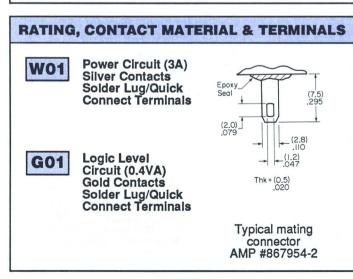
### STANDARD SIZE/REAR PANEL MOUNTING/PANEL SEAL

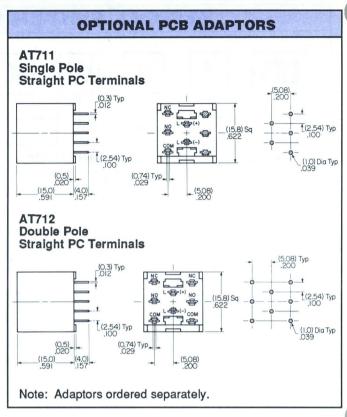
POLES AND CIRCUITS						
		PLUNGER POSITION & TERMINAL NUMBERS				
		( ) = Momentary				
1.5		Normal	Down			
POLE & THROW	MODEL					
SPDT	LB15 LB16	ON ON	(ON) ON			
CONNECTED TERMINALS		1-3	1-2			
SCHEMATICS Power/Lamp		3 • (COMM)	L(+) ●───── (-) L			
DPDT LB25 LB26		ON ON	(ON) ON			
CONNECTED TERMINALS		1-3 4-6	1-2 4-5			
SCHEMATICS Power/Lamp		3 • 2 6 • 5	(-)			
Terminal numbers are not actually on the switch but labels are (NC, NO, COM,						

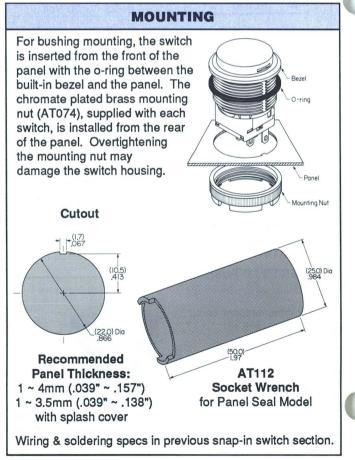


L+, L-). Lamp circuit is isolated and requires an external switch.









T66

### STANDARD SIZE/REAR PANEL MOUNTING/PANEL SEAL

#### **LAMPS**

Electrical specifications and additional information on lamps/ LED are given in the previous section for snap-in mounted

#### Incandescent Lamp



5 Volt



12 Volt



28 Volt

Used with Solid Colored and Colored Insert Caps





T-1 Standard Bi-pin

T-1 Standard Bi-pin

#### **Neon Lamp**



110 Volt



Used with Colored Insert Cap

LED



Single Element



Used with LED Cap



G Blue H Gray

**CAP TYPES & COLOR COMBINATIONS** 

A Black

E Yellow

Solid Cap

**B** White

F Green

J Clear

AT4054

Lens/Filter **Color Codes:** 

Color Codes:

C Red







GJ

Polycarbonate

**Insert Cap** 



Lens/Filter

**Color Codes:** 







Polycarbonate JG

JG & JF not available with neon

Diffuser/LED







Polycarbonate



Cap For Single Element LED

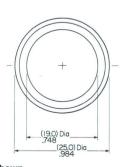
AT4056

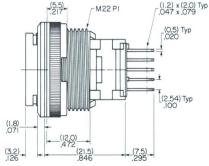


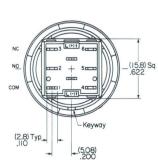


### Waterproof Model/Solder Lug/Quick Connect Terminals/1-2 Pole









Terminals 4, 5 & 6 are not on single pole models.

LB25WKW01-12-JC Model Shown

**T67** 

### STANDARD SIZE/REAR PANEL MOUNTING/PANEL SEAL

### **OPTIONAL SPLASH COVER FOR PANEL SEAL**

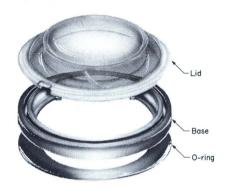
#### AT9410

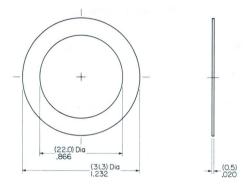
Splash Cover for Panel Seal

Lid: Polyvinyl chloride (loses pliability below 0°C (32°F))

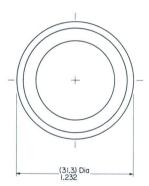
Base: Polyethylene

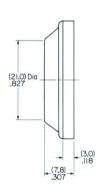
O-ring: Nitrile butadiene rubber (NBR)

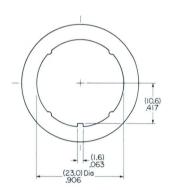




O-ring







Top, side, and bottom views of assembled lid and base.

Recommended panel thickness when using splash cover for panel seal switch: 1mm ~ 3.5mm (.039" ~ .138")

# NKK SERIES DLB

### STANDARD SIZE/PANEL MOUNT/POWER RATED

### **DISTINCTIVE FEATURES**

High strength plastic caps available in various styles and shapes. Cap and legend orientation maintained by key slotted design.

Bright, full face illumination to distinctively indicate status.

Rear panel threaded mounting with compact \_ behind panel design or snap-in mounter for front panel mounting.

5 amp power rating standard. Dry \_ circuit capability available.

Patented detent switching mechanism provides positive indication of actuation.



Heavy gauge steel case \_\_\_\_\_ protects switch components and increases durability.

1500V dielectric strength \_\_\_\_\_\_between contacts and case is accomplished by clinching the frame away from the terminals.

Solder lug and PC terminals \_ staked into base.

NKK® Switches

# NKK® SERIES DLB

### STANDARD SIZE/PANEL MOUNT/POWER RATED

### **APPLICATION DATA**



DLB switches have been especially designed for durability and variety of options. These devices are double pole with momentary or alternate action circuits. On alternate action models, after transferring circuit, the button returns to its original position and does not latch down. Solder lug or PC terminals are available with either silver or gold contacts. Lamps are offered in 6, 14, or 28 volts for incandescent or 110 volts for neon. A single element LED provides for spot illumination. The variety of cap styles and colors enhances front panel appearance. Solid colored and spot illuminated caps come in both square and round shapes. A design cap with colored lens is also available. DLB's rugged construction and flexibility have allowed these switches to be widely used in control panels, computer peripherals, as well as machines and equipment for the transportation, health care and communication industries.

#### **BUSHING MOUNTED**

Bushings for DLB switches are 12mm in diameter for standard rear panel mounting. Minimal behind panel dimension of .969" conserves space. The threaded bushing has a keyway to prevent rotation. A hexagon nut, lock washer and face nut are provided with each switch.



### **SNAP-IN MOUNTED**

Front panel snap-in mounting is achieved using the optional snap-in mounter. Both round and square shaped mounters are available in black only. Round mounters have a projection for antirotation. Mounters are fully assembled on switches or may be ordered separately.



### STANDARD SIZE/PANEL MOUNT/POWER RATED

### **GENERAL SPECIFICATIONS**

5A @ 125V AC, 3A @ 250V AC or 3A @ 30V DC for silver contacts **Electrical Capacity:** 

0.4VA maximum @ 28V maximum AC/DC or (Resistive Load) 5A @ 125V AC for gold over silver contacts

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

10 milliohms maximum for silver Contact Resistance:

20 milliohms maximum for gold

200 megohms minimum @ 500V DC Insulation Resistance:

1,000V AC minimum between contacts Dielectric Strength:

1,500V AC minimum between contacts and case

Mechanical Life: 30,000 operations minimum

**Electrical Life:** 10,000 operations minimum

-10°C through +50°C (+14°F through +122°F) for illuminated **Ambient Temp Range:** 

-10°C through +70°C (+14°F through +158°F) for nonilluminated

Low temperature lubricant available

Pretravel (Approximate): 1.0mm (.039")

Overtravel (Approximate): 4.0mm (.157")

Total Travel (Approximate): 5.0mm (.196")

**Nominal Operating Force:** 1,300 grams for momentary; 1,200 grams for alternate action

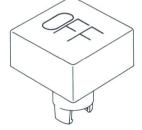
MATERIALS AND FINISHES		
Plunger	Polyacetal resin	
Bushing	Brass with chrome plating	
Housing	Steel, chromate over zinc	
Movable Contact	Silver	
Stationary Contacts	Silver with silver plating or silver with gold plating over nickel undercoating	
Base	Phenolic resin	
Common Terminals	Copper with silver plating	
End Terminals	Copper with silver plating or copper with gold plating over nickel undercoating	
Lamp Terminals	Brass with nickel plating	

#### **UL RECOGNITION**

All models with ratings of 5A @ 125V AC are recognized by Underwriters Laboratories Inc. UL File No. E44145

### **INSCRIPTIONS**

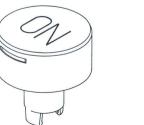
Inscriptions can be placed on any of the solid colored caps or the design cap. Details regarding hotstamping or engraving can be obtained from the factory.



Solid Cap

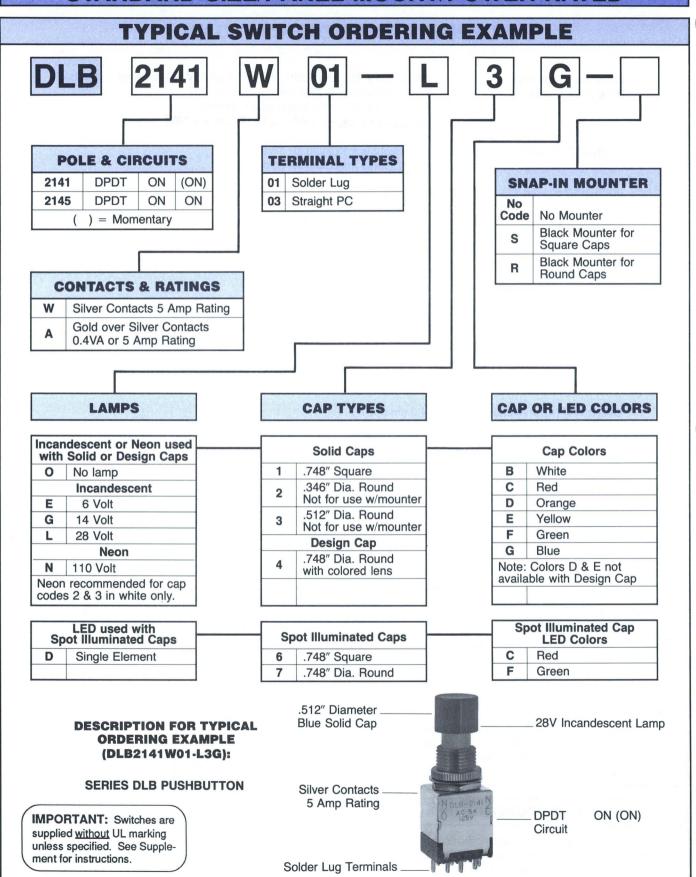
Design Cap







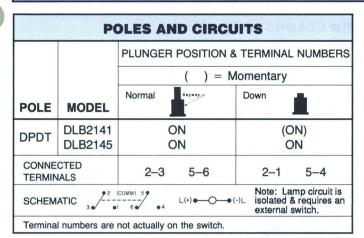
### STANDARD SIZE/PANEL MOUNT/POWER RATED





### **SERIES DLB PUSHBUTTON SWITCHES**

### STANDARD SIZE/PANEL MOUNT/POWER RATED



### **CONTACTS & RATINGS**

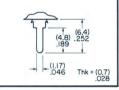
W Silver 5 Amp Power Circuit

Gold over Silver
0.4VA Logic Level or 5 Amp Power Circuit

### **TERMINAL TYPES**

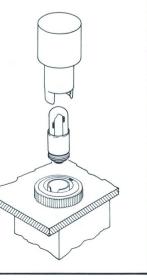
Solder Lug Terminals
Wiring & soldering details follow.





### FRONT PANEL RELAMPING

Lamps are easily replaced from the front of the panel without any special tools. Simply remove the one piece cap to expose the lamp. The lamp snaps into the lamp assembly. Two keys projecting from the cap fit securely into slots in the lamp assembly preventing cap rotation.



#### **LAMPS**

#### AT604 Incandescent



6 Volt



14 Volt



Used with Solid Colored and Design Caps

T-1 3/4 Midget Groove Base

When ordering separately, identify voltage after AT number. Example: AT604-14V.

ELECTRICAL SPECIFICATIONS							
Voltage	Voltage V 6V 14V 28V						
Current	1	200mA	80mA	40mA			
Endurance	Hours	1,000	750	1,000			

### AT604N Neon



110 Volt

T-1 3/4 Midget Groove Base



Used with Solid Colored and Design Caps

Neon recommended with AT417 & AT418 in white only

### ELECTRICAL SPECIFICATIONS

Voltage	V	110V	Recommended Resistor:
Current	- 1	1.5mA	33K ohms for 110V AC
Endurance	Hours	10,000	100K ohms for 220V AC

LED



Single Element

Factory assembled in Spot Illuminated Caps

### **ELECTRICAL SPECIFICATIONS**

		Red	Green
Forward Peak Current	I <sub>FM</sub>	35mA	30mA
Continuous Forward Current	I <sub>F</sub>	25mA	20mA
Forward Voltage	$V_{F}$	1.65V	2V
Reverse Peak Voltage	$V_{RM}$	3V	3V
Current Reduction Rate		0.57mA/°C	0.43mA/°C
Above 25°C	$\Delta I_{F}$		

Electrical specifications are determined at a basic temperature of 25°C. Lamp circuit is independent of switch operation. Dimension drawings of lamps are in the accessories section at the end of this catalog. If the source voltage exceeds the lamp's rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula at the end of the catalog.

NKK°

### **NKK** SERIES DLB PUSHBUTTON SWITCHES

### STANDARD SIZE/PANEL MOUNT/POWER RATED

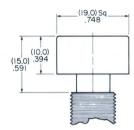
### **CAP TYPES AND COLORS**

### **Solid Colored Caps**

**AT419** 1 .748" Square

> Translucent Polycarbonate

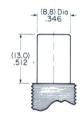




**AT417** 2 .346" Dia. Round

> Translucent Polycarbonate





Cap Colors:

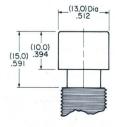
- White
- C Red
- **Orange**
- Yellow
- Green
- G Blue

Used with Incandescent or Neon Lamp AT604

**AT418** 3 .512" Dia. Round

> Translucent Polycarbonate



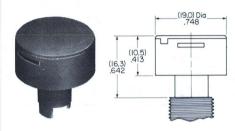


AT417 and AT418 are not for use with snap-in mounter.

#### **Design Cap**

**AT446** .748" Dia, Round with colored lens

Polycarbonate



**Lens Colors:** 

- B White
- C Red
- Green
- Blue

Used with Incandescent Lamp AT604

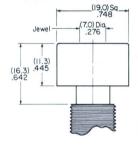
Black opaque holder with translucent lens.

### **Spot Illuminated Cap**

**AT463** .748" Square

Polycarbonate





**LED Colors:** 

- Red
  - Green

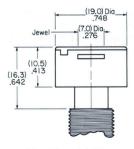
LED factory assembled in cap. Not available as separate pieces.



**AT464** 

.748" Dia. Round

Polycarbonate



Black opaque cap with colored LED.

**NKK®** 

T74

### **NKK** SERIES DLB PUSHBUTTON SWITCHES

R

### STANDARD SIZE/PANEL MOUNT/POWER RATED

### **OPTIONAL SNAP-IN MOUNTERS**



AT517 **Mounter for Square Caps** 

The standard mounting hardware provided with the

switch is used to assemble the squarre mounter.

Fiberglass reinforced nylon Black only available

Panel Cutout:

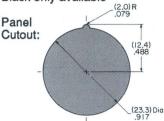




Panel Thickness: 1.0 ~ 4.0mm  $(.039 \sim .157")$ 

**Mounter for Round Caps** 

Fiberglass reinforced nylon Black only available



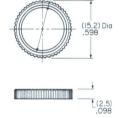


Panel Thickness: 1.0 ~ 4.0mm  $(.039 \sim .157")$ 

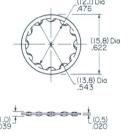
A Locking Ring AT506 and Hex Nut AT527 are provided with the round mounter. It is assembled to the switch with this hardware plus the lockwasher and hex nut provided as standard hardware with the switch. Not for use with Solid Caps AT417 & AT418.

### STANDARD MOUNTING HARDWARE PROVIDED WITH SWITCH

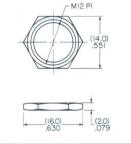
AT504 **Knurled Face Nut** Brass with chrome plating





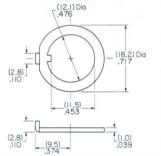


### AT527 **Hex Nut** Steel with nickel plating



### **OPTIONAL HARDWARE**

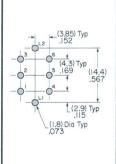




### **MAX. EFFECTIVE PANEL THICKNESS & CUTOUTS**

	Panel Thickness	Panel Cutouts
Bushing Mounting w/Standard Hardware	6.5mm (.256")	- (12.5) Dia
Bushing Mounting w/Standard Hardware and Keyway	6.5mm (.256")	(12.5) Dia (492) (11.5) (11.5) (11.5) (15.5) (10.5)
Bushing Mounting w/Standard Hardware and Locking Ring	5.5mm (.217")	(12.5) Dia (492 (9.0) (3.0) Dia (118

### PC MOUNTING



### **SOLDERING & WIRING**

### Soldering

3 seconds at 350° 5 seconds at 270°

### Wiring

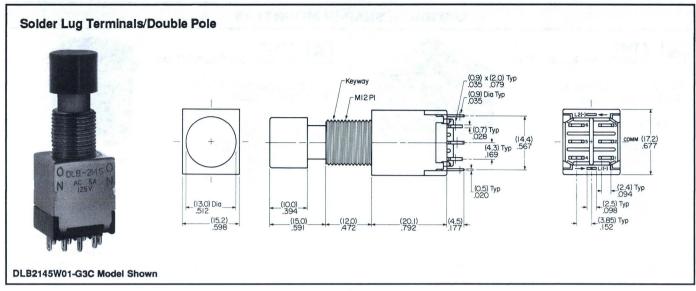
Dimension of the hole in the power terminals is .035" x .079" and accommodates one solid 20-gauge wire or two solid or stranded 22-gauge wires.

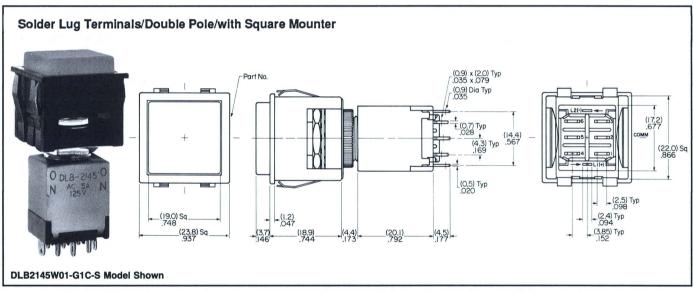
Diameter of the hole for lamp terminals is .035" and accommodates one solid 20-gauge wire.

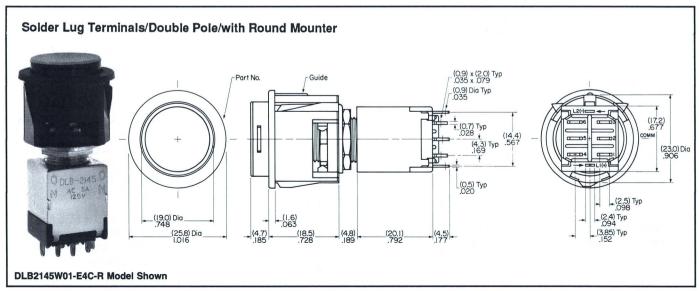
**DKK®** 

### **NKK** SERIES DLB PUSHBUTTON SWITCHES

### STANDARD SIZE/PANEL MOUNT/POWER RATED







### NKK® SERIES MLW

### MINIATURE/SNAP-IN MOUNTED/POWER RATED

### **DISTINCTIVE FEATURES**

Industry's first miniature snap-in, lighted rocker switch. Patented internationally.

Actuators in various styles operate with firm, \_ well-defined movements.

Interlocking actuator prevents switch failure due to jamming or window locking.

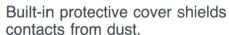
Two bezel sizes adapt to varied panel cutouts.

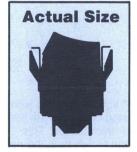
Unique stainless steel retaining clips \_ securely hold switches over a range of panel thicknesses even when exposed to vibration.

Space conserving front panel mounting with minimum behind panel dimension of .902".

Durable stainless steel housing prevents corrosion.

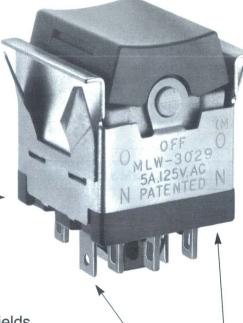
Isolated lamp circuit for incandescent, LED and neon lamps. Front panel relamping.





Extended lamp terminal for ease of wiring.

Epoxy sealed solder lug terminals lock out flux, dust and other contaminants.

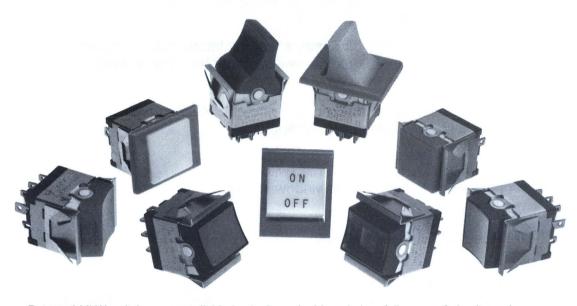


nkk® switches

### NKK® SERIES MLW

### MINIATURE/SNAP-IN MOUNTED/POWER RATED

### **APPLICATION DATA**



Patented MLW switches are available in single or double pole in a full range of circuits and are suitable for a variety of industrial applications. Illuminated rockers and paddles are available in eight colors. A companion indicator in eight matching colors is included in this series. Design rockers have transparent colored lenses with incandescent lamps. A spot illuminated rocker allows red or green LED illumination. Accessories include two sizes of decorative bezels which accommodate two different panel openings. Applications for MLW devices include: testing and processing instruments, semiconductor processing equipment, computer peripherals and aviation instrumentation.

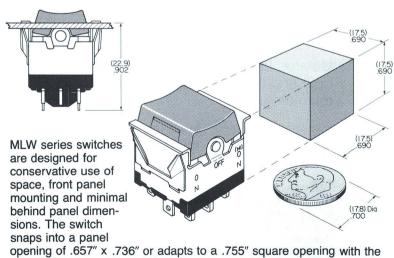
#### **BEZEL ASSEMBLY**

### To attach bezel:

- 1. Pry out tab on bezel to a 45° angle.
- Insert switch frame under tab and snap on bezel.
- Push tab back into place.
- 4. Snap cap onto switch.



### **COMPACT PANEL MOUNTING**



opening of .657" X .736" or adapts to a .755" square opening with the use of the optional large bezel. Double retaining clips hold the switch securely over a .039" to .157" range of panel thicknesses. This patented design helps prevent loosening of the switch from the panel even under conditions of vibration.

### MINIATURE/SNAP-IN MOUNTED/POWER RATED

### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

5A @ 125V AC

(Resistive Load)

Contact Resistance:

10 milliohms maximum

Insulation Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life:

30,000 operations minimum

Electrical Life:

10,000 operations minimum

**Ambient Temp Range:** 

Illuminated: -10°C through +50°C (+14°F through +122°F)

Nonilluminated:  $-10^{\circ}$ C through  $+70^{\circ}$ C ( $+14^{\circ}$ F through  $+158^{\circ}$ F)

**Nominal Operating Force:** 

Rockers: 1014 grams Paddles: 460 grams

Angle of Throw:

26°

MATERIALS AND FINISHES			
Housing Stainless steel			
Movable Contacts	Silver alloy		
Stationary Contacts Silver			
Base Phenolic resin			
Common Terminal Copper with silver plating			
End Terminals Copper with silver plating			
Lamp Terminals Phosphor bronze with nickel platin			

#### **UL & CSA**

Double pole models rated 5A @ 125V AC are recognized by Underwriters Laboratories Inc.

UL File No. E44145

Canadian Standards Association certifies the double pole models rated 5A @ 125V AC and 3A @ 250V AC.

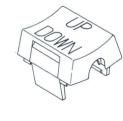
CSA File Nos. LR23535 & LR56017

#### INSCRIPTIONS

Inscriptions can be placed on the design cap lens, rocker cap, indicator cap or bezel. Up to three lines may be inscribed on caps. Details regarding hot stamping or engraving can be obtained from the factory.

Design Cap



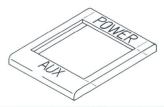


Rocker Cap

Indicator Cap

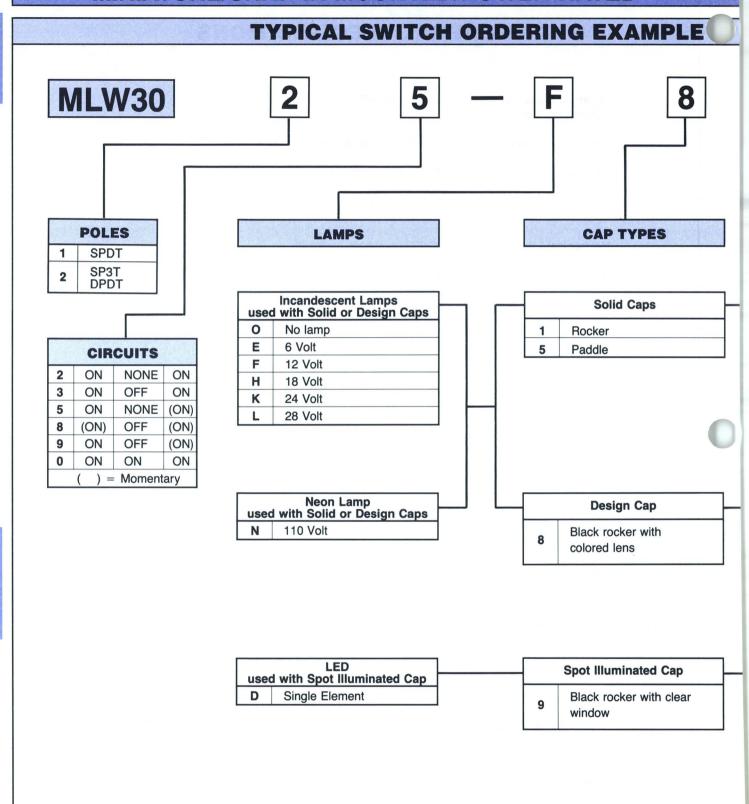


Bezel

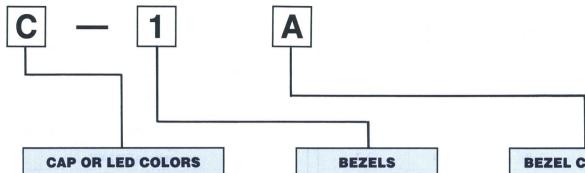


NKK° switches

### MINIATURE/SNAP-IN MOUNTED/POWER RATED



### AND ASSEMBLY ORDERING EXAMPLE



_	Solid Cap Colors				
Α	Black				
В	White				
С	Red				
D	Orange				
E	Yellow				
F	Green				
G	Blue				

	BEZELS	BE	ZEL COLORS
ı	.787" Wide	Α	Black
2	.937" Wide	В	White
		С	Red
		D	Orange
		E	Yellow
		F	Green
		G	Blue
		н	Grav

<b>Design Cap Lens Colors</b>		
В	White	
С	Red	
D	Orange	
F	Green	
G	Blue	

	Design Cap Lens Colors		
В	White		
С	Red		
D	Orange		
F	Green		
G	Blue		

	Spot Illuminated Cap LED Colors	
С	Red illumination	
F	Green illumination	

### **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (MLW3025-F8C-1A):**

**SERIES MLW ROCKER** 



**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

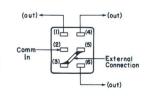
### MINIATURE/SNAP-IN MOUNTED/POWER RATED

POLES AND CIRCUITS					
		ACTUATOR POSITION & TERMINAL NUMBERS			
		( ) = Momentary			
POLE & THROW	MODEL	Up <b>S</b>	Center	Down	
SPDT	MLW3012 MLW3013 MLW3015 MLW3018 MLW3019	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	
CONNEC		2–3	OPEN	2–1	
SCHEMAT	'IC	2 (COMM) L(+)	—O—●(-)∟ isola	e: Lamp circuit is ted & requires an rnal switch.	
DPDT	MLW3022 MLW3023 MLW3025 MLW3028 MLW3029	ON ON ON (ON) ON	NONE OFF NONE OFF	ON ON (ON) (ON) (ON)	
CONNECTED TERMINALS		2–3 5–6	OPEN	2-1 5-4	
SCHEMATIC					
SP3T	MLW3020	ON	ON	ON	
With Extra Connection		2–6	2–4	2–1	
W/O Extra Connection		2–3 5–6	2–3 5–4	2–1 5–4	
SCHEMATIC    External Connection					
Terminal numbers not actually on switch.					

### **THREE-ON POSITION**

In the manufacture of MLW 3020, a double pole throw switch is converted to a single pole with 3 independent circuits. The extra connection shown in the diagram must be made during field installation.

Note that terminal numbers are not actually indicated on the switch.



#### LAMPS

#### AT602 Incandescent



6 Volt





12 Volt



18 Volt



Used with Solid and **Design Caps** 

T-11/2 Pilot Slide Base

24 Volt

28 Volt

When ordering separately, identify voltage after AT number. For example: AT602-6V.

### **ELECTRICAL SPECIFICATIONS**

#### **AT602N** Neon



110 Volt



Used with Solid and Design Caps

Neon recommended with red caps only.

### **ELECTRICAL SPECIFICATIONS**

Voltage V	110V	Recommended Resistor:
Current I	1.5mA	33K ohms for 110V AC
Endurance	25,000 Hours	100K ohms for 220V AC

#### AT606 LED



Single **Element** 



Used with Spot Illuminated Caps

T-11/2 Pilot Slide Base

### **ELECTRICAL SPECIFICATIONS**

		Red	Green
Forward Peak Current	I <sub>FM</sub>	25mA	30mA
Continuous Forward Current	I <sub>F</sub>	20mA	25mA
Forward Voltage	$V_{F}$	2.8V	2.8V
Reverse Peak Voltage	$V_{RM}$	4V	4V
Current Reduction Rate Above 25°C	$\Delta I_{F}$	0.33mA/°C	0.40mA/°C

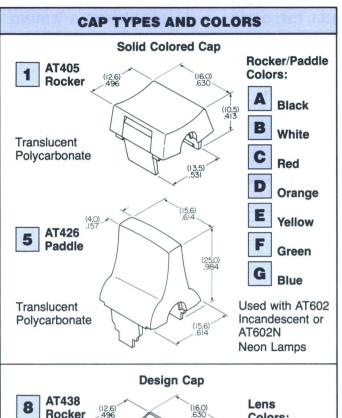
Electrical specifications are determined at a basic temperature of 25°C. Lamp circuit is independent of switch operation. Dimension drawings of lamps are in the accessories section at the end of this catalog. If the source voltage exceeds the lamp's rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula at the end of the catalog.

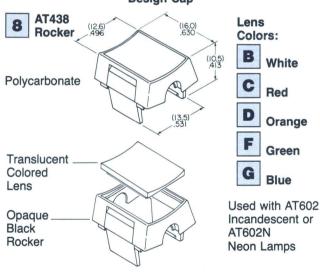


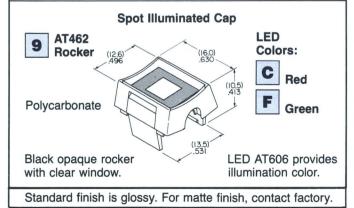
# Illuminate

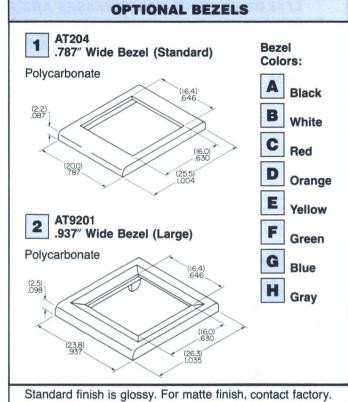
### **NKK** SERIES MLW ROCKER SWITCHES

### MINIATURE/SNAP-IN MOUNTED/POWER RATED





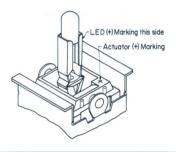


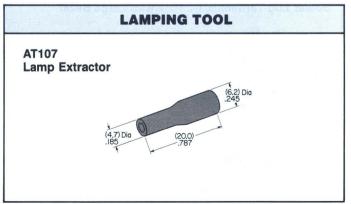


### FRONT PANEL RELAMPING

Lamps and LEDs can be changed without removing the switch from the panel. The lamp extractor (AT107) assists in removing and inserting lamps and LEDs.

Note: When changing LEDs, match the positive polarity markings on both lamp base and actuator block.





THK®

Switches • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

### MINIATURE/SNAP-IN MOUNTED/POWER RATED

#### **EFFECTIVE PANEL THICKNESSES AND PANEL CUTOUTS** With Standard With Large Without Bezel Bezel AT204 Bezel AT9201 **Panel** 1.0 ~ 4.0mm 1.0 ~ 3.0mm 1.0 ~ 3.0mm Thickness: $(.039 \sim .157")$ $(.039 \sim .118")$ $(.039 \sim .118")$ (18.7) Panel **Cutout:** (16.7) (19.2) Sq

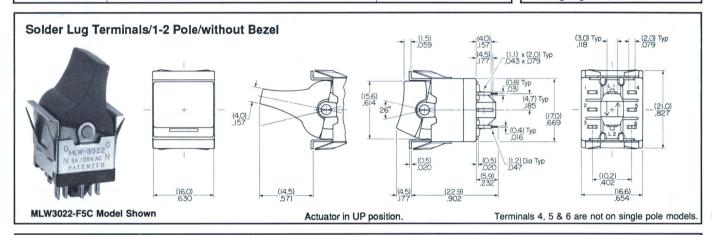
#### **SOLDERING & WIRING**

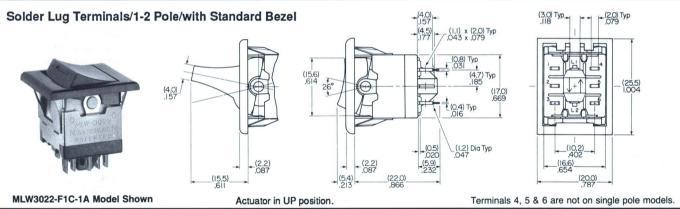
#### Soldering:

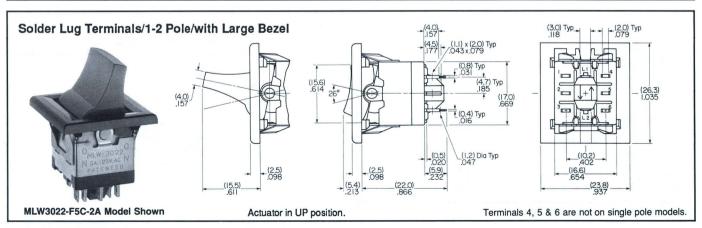
3 seconds at 350°C 5 seconds at 270°C

#### Wiring:

.043" X .079" oblong holes accommodate one solid 18-gauge wire or two solid or stranded 22-gauge wires. Lamp terminals have .047" diameter holes which accommodate one solid 18-gauge wire.

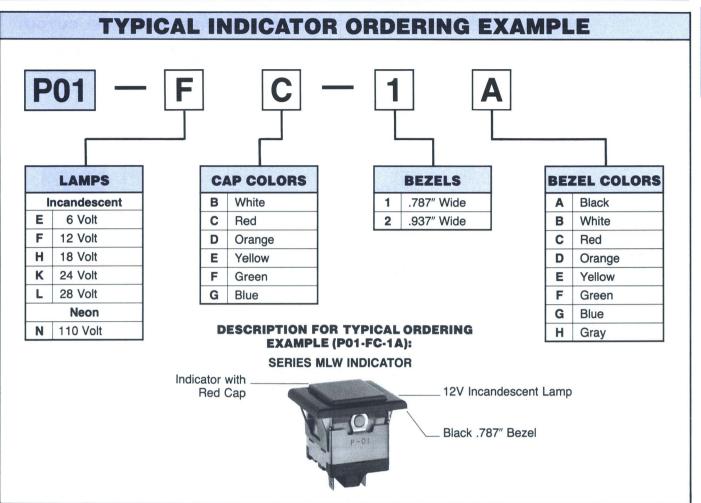


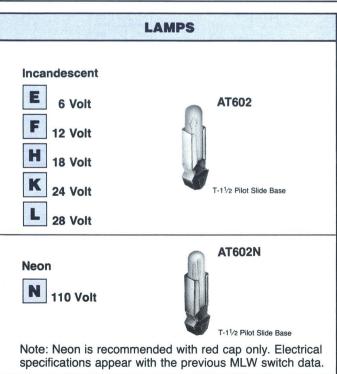


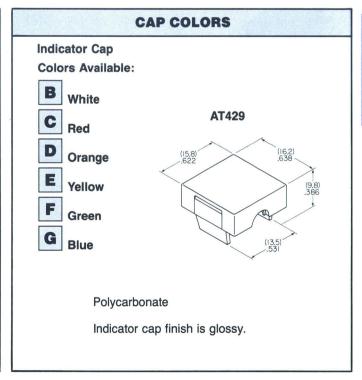


### **NKK** SERIES MLW INDICATOR

### MINIATURE/SNAP-IN MOUNTED



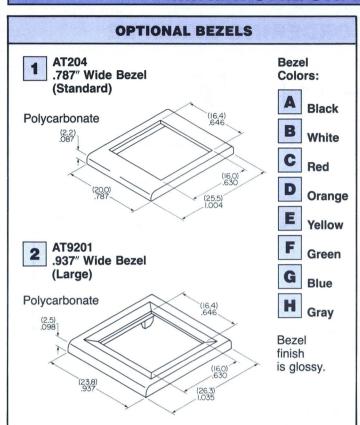




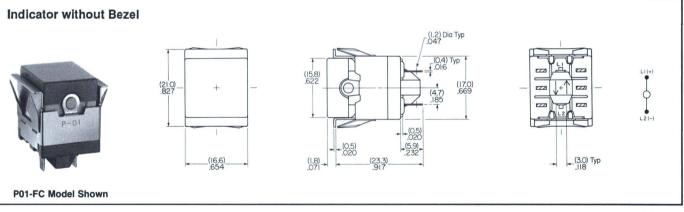
NKK®

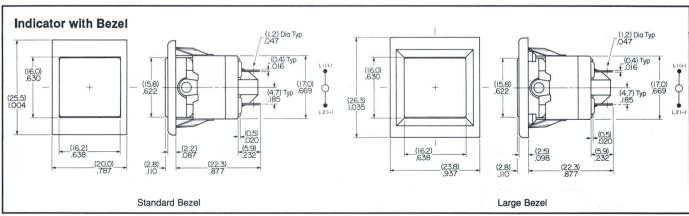
### **NKK** SERIES MLW INDICATOR

### MINIATURE/SNAP-IN MOUNTED



	Panel Thickness	Panel Cutout
Without Bezel	1.0 ~ 4.0mm (.039 ~ .157")	
With Standard Bezel AT204	1.0 ~ 3.0mm (.039 ~ .118")	- + - (18. 7.3 (16.7) .657
With Large Bezel AT9201	1.0 ~ 3.0mm (.039 ~ .118")	- +





### NKK SERIES LW

### STANDARD SIZE/DUAL LAMPS/SNAP-IN MOUNTED

### **DISTINCTIVE FEATURES**

Each half of the rocker face is distinctly illuminated due to partitioned rocker construction and dual lamps.

Selection of colored rocker filters and lamp covers provides numerous lighting combinations.

Snap-in mounting allows fast, easy installation of switch into panel.

Patented stainless steel retaining clips provide secure mounting over a wider range of panel thicknesses.

Dual incandescent or neon lamps operate independently of each other.





Stationary lamp sockets are independent of rocker actuation, protecting lamps from damage due to shock and vibration.

Switch contacts are rated at 10 amps 125VAC which makes these devices well suited for various power switching applications.

NHH® switches . 78

### STANDARD SIZE/DUAL LAMPS/SNAP-IN MOUNTED

### **GENERAL SPECIFICATIONS**

**Electrical Capacity:** 

(Resistive Load)

10A @ 125V AC

6A @ 250V AC

6A @ 30V DC

(Inductive Load)

5A @ 125V AC (P.F. @ .60)

**Contact Resistance:** 

10 milliohms maximum

Insulation Resistance:

200 megohms minimum @ 500V DC

Dielectric Strength:

1,500V AC minimum

**Mechanical Life:** 

30,000 operations minimum

**Electrical Life:** 

10,000 operations minimum

**Ambient Temp Range:** 

Illuminated:

 $-15^{\circ}$ C through  $+50^{\circ}$ C ( $+5^{\circ}$ F through  $+122^{\circ}$ F)

Nonilluminated:

 $-15^{\circ}$ C through  $+70^{\circ}$ C ( $+5^{\circ}$ F through  $+158^{\circ}$ F)

Angle of Throw:

34°

**Nominal Operating Force:** 

1,200 grams for maintained

1,800 grams for momentary

MATERIALS AND FINISHES				
Housing	Steel with chrome plating			
Movable Contacts	Silver clad copper			
Stationary Contacts	Copper with silver plating			
Base	Phenolic resin			
Common Terminal	Copper with silver plating			
End Terminals	Brass with silver plating			
Lamp Terminals	Phosphor bronze with nickel plating			

#### **UL RECOGNITION**

All devices are recognized by Underwriters Laboratories Inc. for 10A @ 125V AC and 6A @ 250V AC.

UL File No. E44145

### **SWITCH ASSEMBLY** White or Clear Rocker

Colored Translucent Filters

or

Lamp Covers



Incandescent or Neon Lamps



LW-3123 Up Position

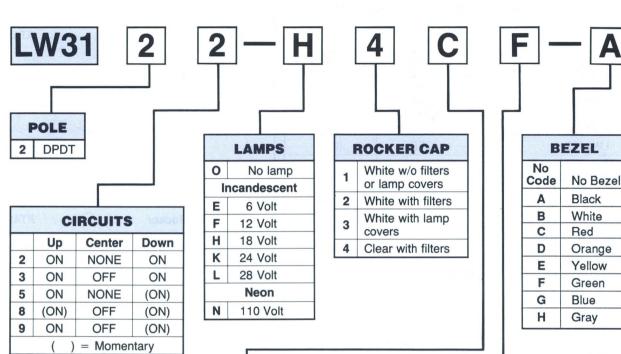
**Various** illumination effects may be achieved by using the white or clear rocker with colored filters or lamp covers. Different colors may be selected for each side of the rocker. Select the color desired for both the up and down positions of the actuator and corresponding circuit functions.

Down Position

T88

### STANDARD SIZE/DUAL LAMPS/SNAP-IN MOUNTED





L/	AMP COVER/FILTER COLORS FOR UP POSITION
0	No cover/filter
	Lamp Cover
С	Red
D	Orange
F	Green
	Filter
В	White
C	Red
D	Orange
E	Yellow
F	Green
G	Blue

L/	LAMP COVER/FILTER COLORS FOR DOWN POSITION				
0	No cover/filter				
	Lamp Cover				
С	Red				
D	Orange				
F	Green				
	Filter				
В	White				
С	Red				
D	Orange				
E	Yellow				
F	Green				
G	Blue				

### **DESCRIPTION FOR TYPICAL ORDERING EXAMPLE (LW3122-H4CF-A):**

**SERIES LW ROCKER** 

**IMPORTANT:** Switches are supplied without UL marking unless specified. See Supplement for instructions.

18V Incandescent Lamp Black Bezel

Clear Rocker with Red Filter in Up Position and Green Filter in Down Position

ON-NONE-ON Circuit **DPDT** 

### STANDARD SIZE/DUAL LAMPS/SNAP-IN MOUNTED

POLES AND CIRCUITS							
		RC	OCKER PO	SITION & TE	RMIN	AL NUME	BER
			( ) = Momentary				
POLE & THROW		Up _		Center	•	Down	1
DPDT	LW3122 LW3123 LW3125 LW3128 LW3129	(0	ON ON ON ON)	NONE OFF NONE OFF OFF		(0	DN DN DN) DN)
CONNECTERMINATE TERMINATE		2–3	5–6	OPEN		2–1	5–4
SCHEMATIC							
Terminal numbers not actually on switch.							

WGI <sub>B</sub> Y	LAMPS			
AT602 Incandescent	For higher intensi lamp, rated 40mA 28V, contact factor	(@		
F 12 Volt				
H 18 Volt	T-11/2 Pilot Slide Base			
K 24 Volt	When ordering separately, identify vo after AT number. Example: AT602-1			
AT602N Neon	Neon not for use green lamp cover blue and green fil	or		
	T-11/2 Pilot Slide Base			
ELI	ECTRICAL SPECIFICATIONS			
	Incandescent Nec			

		0111107	01 20	IFICATI	0110		
			Inc	andesc	ent		Neon
Voltage	V	6V	12V	18V	24V	28V	110V
Current	- 1	80mA	50mA	35mA	25mA	22mA	1.5mA
Endurance	Hours			2,000			25,000

Recommended Resistors for Neon: 33K ohms for 110V AC 100K ohms for 220V AC

> Electrical specifications are determined at a basic temperature of 25°C. Lamp circuit is independent of switch operation. Dimension drawings of lamps are in the accessories section at the end of this catalog. If the source voltage exceeds the lamp's rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula at the end of the catalog.

### ROCKER CAP **White Rocker** AT420B without filters (19.0) (22.4) or lamp covers (27.6) White Rocker **AT420B** with filters AT421 White Rocker AT420B with lamp covers AT416 Clear Rocker **AT420J** 4 with filters AT421 AT420B & AT420J are polycarbonate

### STANDARD SIZE/DUAL LAMPS/SNAP-IN MOUNTED

### LAMP COVER/FILTER COLORS

Indicate the lamp cover or filter color desired in both the up and down positions.

**Color Codes:** 

**Lamp Cover** 

Red

D

B

**Orange** 

Green

AT416 Lamp Cover

Silicon Rubber

Color Codes:

White

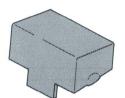
C Red

D Orange

E Yellow

F Green

G Blue **Rocker Filter** 



AT421 Filter

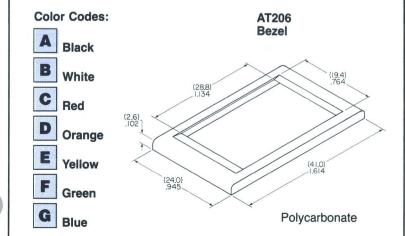
Polycarbonate

#### **LAMPING TOOL**



Lamps can be changed without removing the switch from the panel. AT107 assists in removing lamps from the switch.

### **OPTIONAL BEZEL**



#### **SOLDERING & WIRING**

**Soldering Time & Temperature Limits:** 

3 seconds at 350°C

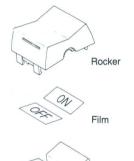
5 seconds at 270°C

Wiring Specifications:

Each power terminal hole is .079" × .102" oblong which accommodates one solid or stranded 14-gauge wire or two 18-gauge wires. Each lamp terminal hole is .047" diameter and accommodates one solid 18-gauge wire.

### INSCRIPTIONS

Inscriptions can be placed on the rocker. filter or a film inserted between the two. Details regarding hot stamping or engraving may be obtained from the factory.





#### **BEZEL ASSEMBLY**

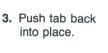
To attach bezel:



1. Pry out tab on bezel to a 45° angle.



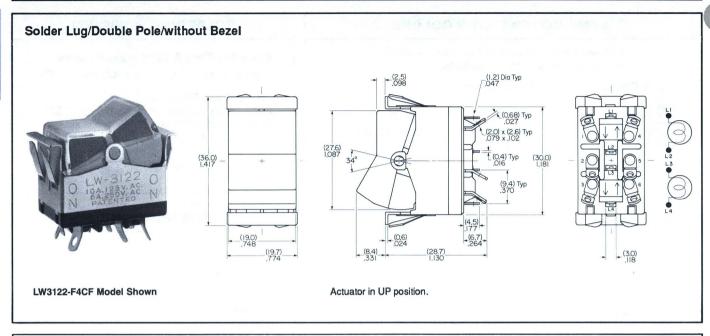
2. Insert switch frame under tab and snap on bezel.

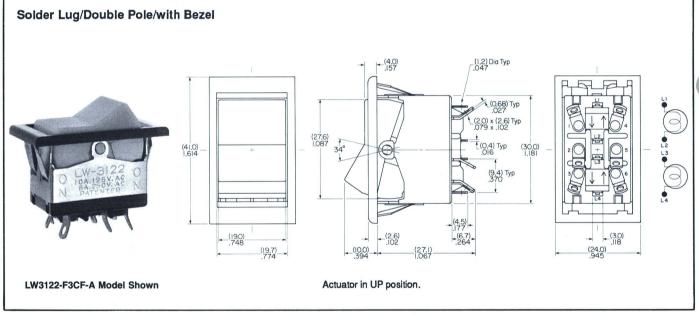






### STANDARD SIZE/DUAL LAMPS/SNAP-IN MOUNTED





	EFFECTIVE PANEL	THICKNESS AND F	PANEL CUTOUT
	Without Bezel	With Bezel	Panel Cutout:
Panel Thickness:	1 ~ 4mm (.039 ~ .157")	1 ~ 3mm (.039 ~ .118″)	- + - (32.0) 1.260 1.260 1.260

### NKK SERIES LW

### STANDARD SIZE/PANEL MOUNTED/HIGH CAPACITY

### LIGHTED POWER ROCKER

### LW3021A



The lighted power rocker completes the LW Series. This device is single pole, single throw with double break contacts. These switches come assembled with a neon lamp which contains a built-in resistor. The rocker is white with a red translucent window for spot illumination. The device has a two screw, flush panel mounting frame.

#### **Actual Size**



#### **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

20A @ 110V AC

**Contact Resistance:** 

10 milliohms maximum

Insulation Resistance:

1,000 megohms minimum @

500V DC

**Dielectric Strength:** 

2,000V AC minimum

**Mechanical Life:** 

30,000 operations minimum

**Electrical Life:** 

10,000 operations minimum

**Ambient Temp Range:** 

-10°C through +50°C

(+14°F through +122°F)

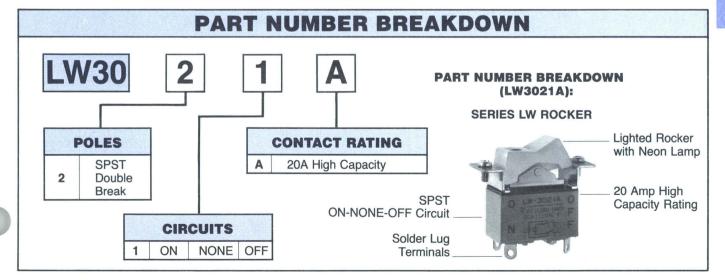
Angle of Throw:

22°

**Nominal Operating Force:** 

1,250 grams

MATERIA	MATERIALS AND FINISHES				
Rocker	Polycarbonate resin				
Mounting Frame	Steel with chrome plating				
Movable Contacts	Silver alloy				
Stationary Contacts	Copper with silver plating				
Base	Phenolic resin				
Common Terminal	Brass with silver plating				
End Terminals	Brass with silver plating				



# Illuminat

### **NKK®** SERIES LW ROCKER SWITCHES

### STANDARD SIZE/PANEL MOUNTED/HIGH CAPACITY

POLES AND CIRCUITS							
		ROCKER POSITION & TERMINAL NUMBERS					
POLE & THROW	MODEL	Up		Center	Down		
SPST	LW3021A	0	N	NONE	OFF		
CONNECTED TERMINALS		1-3	4-6	OPEN	OPEN		
SCHEMATIC  Terminal numbers are on the switch.							

# A neon lamp with built-in ballast resistor is supplied as an integral part of the switch. Voltage V 90–120V AC Internal Series Resistance 100K ohms Current I 0.8mA Endurance 10,000 hours average

#### **SOLDERING & WIRING**

### **Soldering Time & Temperature Limits:**

3 seconds at 350°C

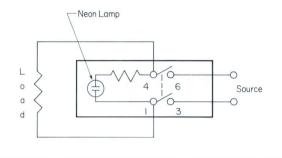
5 seconds at 270°C

### Wiring Specifications:

The .094" diameter holes accommodate one solid or stranded 12-gauge wire or two solid or stranded 20-gauge wires.

#### INTERNAL WIRING DIAGRAM

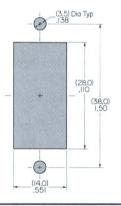
Since this is a double break device, one side of the electrical source should be connected to terminal 3 and the other side to terminal 6. The electrical load should be connected between terminals 1 and 4.

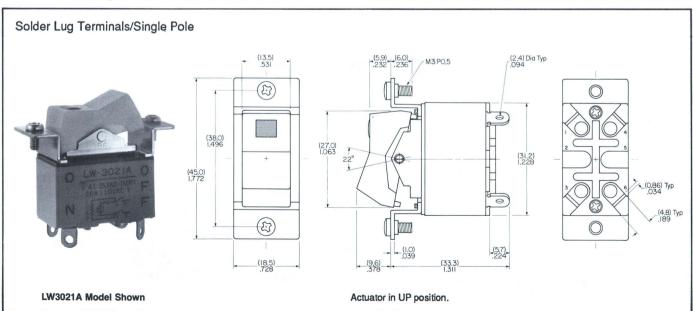


### **MOUNTING DETAILS**

### Panel Cutout:

This device accommodates a maximum panel thickness of 5mm (.197"). Two screws for flush panel mounting are supplied with the switch.





### NKK SERIES M21

### SUBMINIATURE/LED TIPPED ACTUATORS

### **DISTINCTIVE FEATURES**

With the LED located in the tip of the toggle and the paddle, NKK has achieved an industry first. Single and bicolor LED illumination is offered in toggles, rockers, and paddles with synchronous and isolated LED circuits.

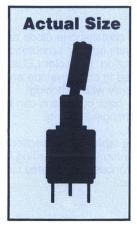
Toggle switches are internally constructed with an antijamming feature which protects the contacts from damage due to excessive downward force on the toggle.

The high torque bushing prevents the bushing from rotating or separating from the metal frame during installation.

The stainless steel frame resists corrosion.

6 amp rated patented silver contacts are of specially composed alloy for hardness.

Insulating barriers, higher than standard, protect against crossover.



Terminals are epoxy sealed to lock out flux, dust, and other contaminants.

1500V dielectric strength between switch \_\_\_ contacts and case is accomplished by clinching the frame away from the terminals.



### NKK® SERIES M21

### SUBMINIATURE/LED TIPPED ACTUATORS

### **APPLICATION DATA**

LED illumination at the tip of the actuators is a design accomplishment unique in the industry. With this feature there is strong, concentrated light emission usable in low light environments and a clearly visible indication of switch status. Subminiature size makes M2100 devices well suited to limited space requirements.

Popular applications in which the switches can be used include instrumentation, test apparatus, radio and TV studio control consoles, private aircraft, and telecommunication equipment.

M2100 Series includes toggles, rockers, and paddles with bushing, snap-in, or flat frame mountings and solder lug, quick connect, and PC terminal options. Three circuit variations, including 3-ON, are offered.

Single pole models are UL Recognized (UL File No. E44145) and CSA Certified (File Nos. LR23535 & LR56017).





#### ANTIJAMMING DESIGN

In some applications where a lever may suffer sharp blows or be subjected to other

harsh treatment, contacts can be deformed by the transmission of downward force to the contact mechanism. Protection against mechanism damage is designed into the M2100 Series

be de sion of the day

the M2100 Series toggle switches. Beneath the toggle joint is a step which rests against the frame of the switch. When downward force is applied to the lever, the frame and step resist movement of the lever and protect the contact mechanism.

#### **LED OPERATION**

The light emitting diode (LED) has the ideal characteristics of being small, durable, and suited to rapid switching. Single and bicolor LEDs of red, yellow, and green are offered in the M2100 Series.

A single color LED contains one diode and can operate independently from or synchronously with switching operation. In bicolor LEDs two diodes are contained in one envelope and operate synchronously with switching operation. Reverse color conditions can be accomplished by changing polarity.

The pole and circuit tables in this section present additional information regarding LED illumination, synchronous and isolated circuits, reversing colors, etc.

### **NKK® SERIES M2100 SWITCHES**

### SUBMINIATURE/LED TIPPED ACTUATORS

### **GENERAL SPECIFICATIONS**

Electrical Capacity: (Resistive Load)

For Silver Contacts: 6A @ 125V AC; 3A @ 250V AC; 3A @ 30V DC

For Gold contacts: 0.4VA maximum @ 28V AC/DC maximum

(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

**Contact Resistance:** 

10 milliohms maximum

Insulation Resistance:

1,000 megohms minimum @ 500V DC

Dielectric Strength:

1.000V AC minimum between contacts

1,500V AC minimum between contacts and case

Mechanical Life:

50,000 operations minimum

**Electrical Life:** 

25,000 operations minimum

Ambient Temp. Range:

-10°C through +55°C (+14°F through +131°F) for toggles & rockers

-25°C through +70°C (-13°F through +158°F) for paddles

Angle of Throw:

20°

**Nominal Operating Force:** 

Single Pole

Double Pole

Toggles & Paddles
ON to ON position

1

325 grams 45

450 grams 720 grams

OFF to ON position Rockers

ON to ON position

650 grams

400 grams

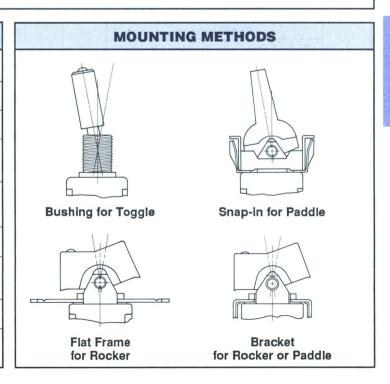
1400 grams

OFF to ON position

1000 grams

1800 grams

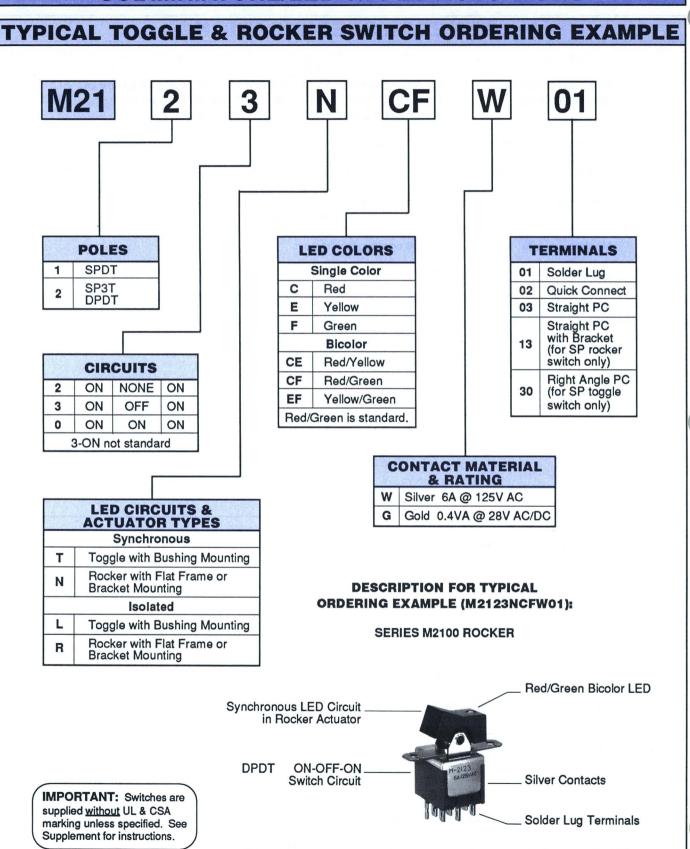
MATERIALS & FINISHES						
Bushing	Brass with nickel plating					
Housing	Stainless steel					
Mounting Bracket	Steel with tin plating					
Movable Contacts	Silver alloy or silver alloy with gold plating over nickel					
Stationary Contact	Silver with silver plating or gold plating over nickel					
Lamp Contacts	Phosphor bronze					
Base	Glass fiber reinforced diallylphthalate (UL-94V-0)					
Power Terminals	Copper with silver or gold plating					
Lamp Terminals	Copper with silver or gold plating					



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### **NKK** SERIES M2100 SWITCHES

### SUBMINIATURE/LED TIPPED ACTUATORS

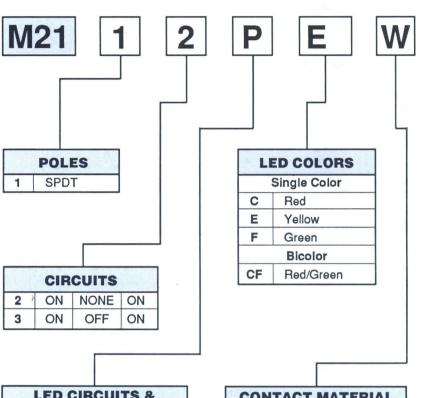


Rockers



### SERIES M2100 SWITCHES





For Snap-in Mount  A Black  B White  C Red  E Yellow  F Green		
A Black B White C Red E Yellow	BEZ	ZEL COLORS
B White C Red E Yellow	For	Snap-in Mount
C Red E Yellow	Α	Black
E Yellow	В	White
	C	Red
E Green	E	Yellow
I Gleen	F	Green
G Blue	G	Blue
H Gray	Н	Gray

### **LED CIRCUITS & ACTUATOR TYPES**

Synchronous Paddle with Snap-in or

**Bracket Mounting** Isolated

P

Paddle with Snap-in or **Bracket Mounting** 

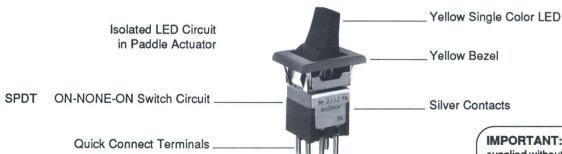
### **CONTACT MATERIAL** & RATING

Silver 6A @ 125V AC Gold 0.4VA @ 28V AC/DC

#### **TERMINALS** For Snap-in Mount 01 Solder Lug 02 **Quick Connect** 03 Straight PC For Bracket Mount Only Straight PC with 13 Bracket (for SP switch only)

**DESCRIPTION FOR TYPICAL ORDERING EXAMPLE** (M2112PEW02-E):

**SERIES M2100 PADDLE** 



**IMPORTANT:** Switches are supplied without UL & CSA marking unless specified. See Supplement for instructions.

**NKK**®

### **DKK** SERIES M2100 SWITCHES

### SUBMINIATURE/LED TIPPED ACTUATORS

			ACTUATOR	R POSITION 8	TERMINAL	
				NUMBERS		
	1.5	34	Down	Center	Up	Real Property (Control of Control
	POLE & THROW	MODEL				SCHEMATICS
	SPDT	M2112	ON	NONE	ON	ISOLATED SINGLE COLOR LED
100	NECTED PO	WER TERMINALS	2–3	NONE	2–1	
	ICOL ATED CI	NGLE COLOR	ON	NONE	ON	2 (COMM)
		ECTED TERMINALS	4–6	NONE	4-6	
2						3 4 6
		US SINGLE COLOR	ON	NONE	OFF	,
	CONN	ECTED TERMINALS	4–6	NONE	OPEN	SYNCHRONOUS SINGLE COLOR LED
	SYNCHRONO	US BICOLOR	RED		GREEN	
			RED	NONE	YELLOW	2 (COMM)
	CONN	ECTED TERMINALS	YELLOW 5–6	NONE	GREEN 5–4	<i>f</i>
	COMM	ECTED TERMINALS	5-0	NONE	5-4	
	SPDT	M2113	ON	OFF	ON	3 4 6
10	NECTED PO	WER TERMINALS	2–3	OPEN	2–1	SYNCHRONOUS BICOLOR LED
	ICOL ATED CIL	NCLE COLOR	ON	ON	ON	STNCHONOUS BICOLOR LED
		NGLE COLOR ECTED TERMINALS	ON 4–6	ON 4–6	4–6	2/2011
	200.75.00.400.00					≥ (COMM)
		US SINGLE COLOR	ON	OFF	ON	
	CONN	ECTED TERMINALS	4–6	OPEN	4–6	3 4 5 6
	SYNCHRONO	US BICOLOR		GREEN		
LED CIRCUITS			RED	OFF	YELLOW	A reverse color condition can be obtained by
			YELLOW		GREEN	connecting positive to terminals 4 & 6 and negative
	CONN	ECTED TERMINALS	5–6	OPEN	5–4	to terminal 5.
	DPDT	M2122	ON	NONE	ON	ISOLATED SINGLE COLOR LED
71	INFCTED PO	WER TERMINALS	2–3 5–6	NONE	2-1 5-4	
						2 (COMM) 5
		NGLE COLOR	ON	NONE	ON	<i>                   </i>
	CONN	ECTED TERMINALS	7–9	NONE	7–9	3 4 6 7 9
		US SINGLE COLOR	ON	NONE	OFF	
	CONN	ECTED TERMINALS	7–9	NONE	OPEN	SYNCHRONOUS SINGLE COLOR LED
	SYNCHRONO	US BICOLOR	RED		GREEN	[
			RED	NONE	YELLOW	2 (COMM) 5
	00111		YELLOW	NONE	GREEN	<i>JJ</i>
	CONN	ECTED TERMINALS	8–9	NONE	8–7	
	DPDT	M2123	ON	OFF	ON	3 4 6 7 9
10	NECTED PO	WER TERMINALS	2–3 5–6	OPEN	2-1 5-4	SYNCHRONOUS BICOLOR LED
	70	NGLE COLOR	ON	ON	ON	STRUMONOUS BICULUR LED
		ECTED TERMINALS	7–9	7–9	7–9	2/0000
						2 (COMM) 5
		US SINGLE COLOR	ON	OFF	ON	//~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	CONN	ECTED TERMINALS	7–9	OPEN	7–9	1 3 4 6 7 8 9
)	SYNCHRONO	US BICOLOR	RED		GREEN	
j	e Landres		RED	OFF	YELLOW	A reverse color condition can be obtained by
*	70.		YELLOW		GREEN	connecting positive to terminals 7 & 9 and negative
	CONN	ECTED TERMINALS	8–9	OPEN	8–7	to terminal 8.

### **NKK** SERIES M2100 SWITCHES

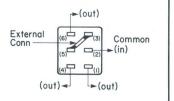
### SUBMINIATURE/LED TIPPED ACTUATORS

				ON CIR	CUIT & I	LED ILL	UMINAT	ION		
		ACTUATOR POSITION & TERMINAL NUME				IBERS				
DOLE 8		Down	Keyway		Center			Up		
	MODEL							1 4 1		
SP3T	M2120	0.0	ON	F 6	0.0	ON	<b>5</b> 4	0.1	ON	5.4
INECTED PO	WER TERMINALS	2–3		5-6	2–3		5-4	2–1		5–4
			ON 7–9			ON 7–9			ON 7–9	
		2 (in)	5	) 7 9 J	2 (in)	5	) 7 9 J	2 (in)	5	out) 7 9
			ON 7–9			OFF OPEN			ON 7–9	
100000000000000000000000000000000000000	THE PROPERTY OF STREET	2 (in)	5	7 9	2 (in)	5	7 9	2 (in)	5	7 9
			RED RED YELLOW 8-9			OFF OPEN			GREEN YELLOW GREEN 8–7	
		2 (in)	5	7 8 9	2 (in)	5	7 8 9	External Conne	5	7 8 9
	SYNCHRONG  SYNCHRONG  SYNCHRONG  SYNCHRONG  SYNCHRONG  SYNCHRONG  SYNCHRONG  SYNCHRONG	SP3T M2120 INECTED POWER TERMINALS  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS	SP3T M2120 INECTED POWER TERMINALS  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  External Connecting 1 (out) 3 4	POLE & THROW MODEL  SP3T M2120  INECTED POWER TERMINALS  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR  SYNCHRONOUS SINGLE COLOR  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR  SCHEMATICS FOR SYN	POLE & THROW  MODEL  SP3T  M2120  ON  INECTED POWER TERMINALS  2-3  5-6  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS	POLE & THROW MODEL  SP3T M2120 INECTED POWER TERMINALS  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  External Connection,  2 (in) 3 4 (out) 6 (out) 7 9  INM  External Connection,  2 (in) 3 4 (out) 6 (out) 7 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  INM  External Connection,  2 (in)  1 (out) 3 4 (out) 6 (out) 7 8 9  INM  INM  INM  INM  INM  INM  INM  IN	THROW MODEL  SP3T M2120 ON INECTED POWER TERMINALS  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHE	THROW MODEL  SP3T M2120  INECTED POWER TERMINALS  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SYNCHRONOUS BICOLOR CONNECTED TERMINALS  SCHEMATICS FOR SYNCHRONOUS BICOLOR  SCHEMAT	POLE & THROW MODEL  SP3T M2120 ON ON INECTED POWER TERMINALS 2-3 5-6 2-3 5-4 2-1  ISOLATED SINGLE COLOR CONNECTED TERMINALS  SCHEMATICS FOR ISOLATED SINGLE COLOR ON 7-9  External Connection, 2 (in) 5 1 (out) 3 4 (out) 6 (out) 7 9 1 (out) 3 4 (out	POLE & THROW MODEL  SP3T M2120 ON O

A revérse color condition can be obtained by connecting positive to terminals 7 & 9 and negative to terminal 8.

**THREE-ON POSITIONS** 

In the manufacture of the M2120 model, a double pole double throw switch is converted to a single pole with 3 independent circuits. The extra connection shown in the diagram must be made during field installation. Note that terminal numbers are not actually indicated on the switch.



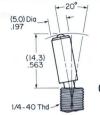
### **NKK** SERIES M2100 SWITCHES

### LED CIRCUIT, ACTUATOR & MOUNTING TYPE COMBINATIONS

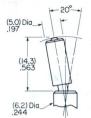
T Toggle with Synchronous LED Circuit

Toggle with Isolated LED Circuit

Brushed aluminum standard finish. Black & bright finish available on request.



Threaded Bushing supplied with **Terminals** 01, 02, & 03



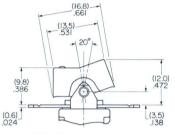
Smooth Bushing supplied with Terminal 30

N Rocker with Synchronous LED Circuit

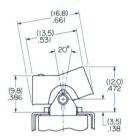
R Rocker with Isolated LED Circuit

Polycarbonate

Black standard; other colors available on request.



Flat Frame supplied with Terminals 01, 02, & 03



Bracket supplied with Terminal 13

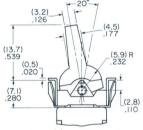
J Paddle with Synchronous LED Circuit

P Paddle with Isolated LED Circuit

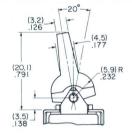
Polycarbonate

Black standard; other colors available on request.

Bezel AT207, shown in the accessories section at the end of this catalog, is available for use with snap-in mounted paddle models.



Snap-in supplied with Terminals 01, 02, & 03



Bracket supplied with Terminal 13

#### **LEDS**

LED Color Codes: C Red E Yellow F Green

Colors available for Toggles & Rockers: C, E, F, CE, CF, & EF. Colors available for Paddles: C, E, F, & CF Red/Green is standard for bicolor. Electrical specifications shown in the Supplement at the end of this catalog.

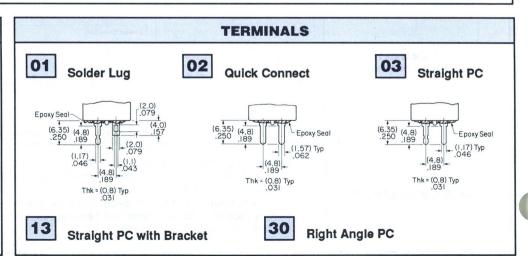
### **CONTACTS & RATINGS**

W Silver

> 6A @ 125V AC 3A @ 250V AC

G Gold

> 0.4VA maximum @ 28V AC/DC



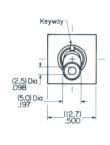
T102

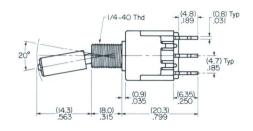
Rockers

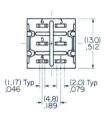
### **SERIES M2100 SWITCHES**

### Toggle/Solder Lug Terminals/Single Pole







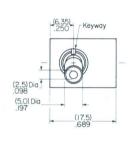


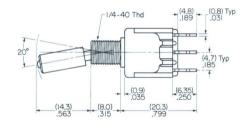
M2112TCFW01 Model Shown

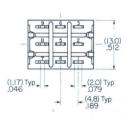
For single color LED switch, terminal 5 is omitted.

### Toggle/Solder Lug Terminals/Double Pole





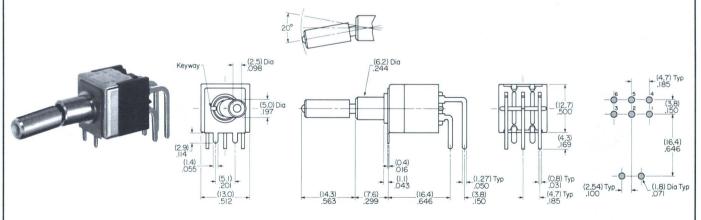




M2122TCFW01 Model Shown

For single color LED switch, terminal 8 is omitted.

### Toggle/Right Angle PC Terminals/Single Pole



M2112TCFG30 Model Shown

For single color LED switch, terminal 5 is omitted.

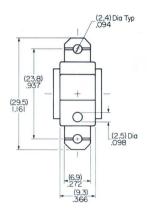
This device is available in single pole only and in two circuits (M2112 \_\_\_\_\_ G30 and M2113 \_\_\_\_ G30). These models have right angle PC terminals with a smooth bushing. Gold contact material is standard. Synchronous or isolated LED circuits with a toggle actuator (T or L LED circuit/actuator codes) are supplied.

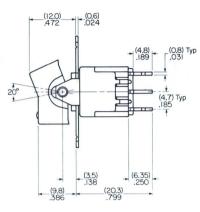
### **NKK** SERIES M2100 SWITCHES

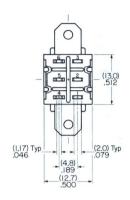
### **TIPPED ACTUATORS**

### Rocker/Solder Lug Terminals/Single Pole









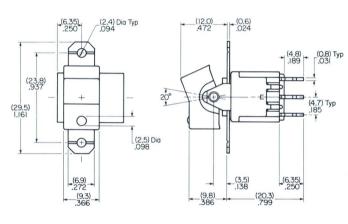
For single color LED switch, terminal 5 is omitted.

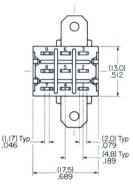
### M2112NCFW01 Model Shown

### Rocker/Solder Lug Terminals/Double Pole



M2122NCFW01 Model Shown

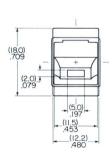


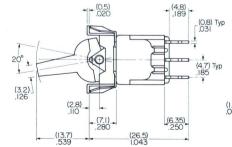


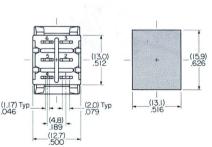
For single color LED switch, terminal 8 is omitted.

### Paddle/Solder Lug Terminals/Single Pole









For single color LED switch, terminal 5 is omitted.

M2112JCFW01 Model Shown

Panel Thickness: 1 ~ 3.2mm (.039" ~ .126") without Bezel 1 ~ 2.5mm (.039" ~ .098") with Bezel

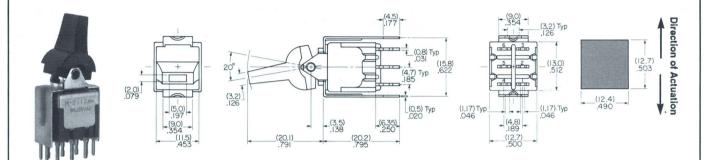
T104

### UKK.

### **SERIES M2100 SWITCHES**

### SUBMINIATURE/LED TIPPED ACTUATORS

Paddle/Straight PC Terminals with Bracket/Single Pole

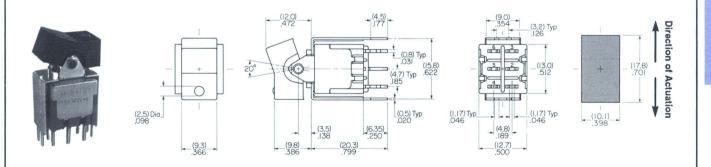


#### M2112JCFW13 Model Shown

For single color LED switch, terminal 5 is omitted.

This device is available in single pole only and in two circuits (M2112 W13 & M2113 W13). These models have a bracket to increase mounting stability of the straight PC terminals. Silver contact material is standard with these devices, which are supplied in synchronous or isolated LED circuits with a paddle actuator (J or P LED circuit/actuator codes).

Rocker/Straight PC Terminals with Bracket/Single Pole



#### M2112NCFW13 Model Shown

For single color LED switch, terminal 5 is omitted.

This device is available and in two circuits (M2112 W13 & M2113 W13). These models have a bracket to increase mounting stability of the straight PC terminals. Silver contact material is standard with these devices, which are supplied in synchronous or isolated LED circuits with a rocker actuator (N or R LED circuit/actuator codes).

### **NKK** SERIES M2100 SWITCHES

### SUBMINIATURE/LED TIPPED ACTUATORS

#### **WIRING & SOLDERING**

Solder lug terminals have a .043" x .079" oval hole which accommodates 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.

### **SOLDERING LIMITS**

The soldering time and temperature limits are 3 seconds at 350°C 5 seconds at 270°C.

#### **MOUNTING HARDWARE**

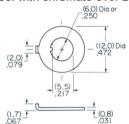
#### Standard Hardware

#### **AT513H**

Hexagon nuts (2 per switch) Brass with nickel plating

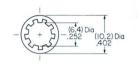


**AT507H** Locking ring (1 per switch) Steel with chromate over zinc



**AT509** 

Lockwasher (1 per switch) Steel with chromate over zinc





Optional Hardware: Knurled nuts, dress nuts, and ON-OFF plates are available.

### **PCB MOUNTING**

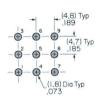
Straight PC Single Pole

Straight PC Double Pole

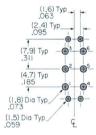
Straight PC w/Bracket Single Pole



For single color LED switch, terminal 5 is omitted.



For single color LED switch, terminal 8 is omitted.



For single color LED switch, terminal 5 is omitted.

Hardware:	With Standard Hardware	Without Locking Ring	Flat Frame
Panel Thickness:	2.6mm (.102")	3.4mm (.134")	3.2mm (.126")
Hardware:	Without Bottom Hex Nut	Without Locking Ring & Bottom Hex Nut	
Panel Thickness:	4.7mm (.185")	5.5mm (.216")	-
Cutout:	-(6.5) Dia .256 (6.5) .256 -(2.2) Dia .087	(6.5) Dia (5.6) (5.6) (5.6) (2.56) (2.56) (3.6) (3.6) (4.5) Dia (6.5) Dia (2.56)	- (17.8) 701 - (23.8) .937 - (2.6) Dia Typ .102

## SUPPLEMENT

Accessories Z2

Hardware Z15

**UL Recognition Z18** 

**CSA Certification Z20** 

**Washability Data Z22** 

**Conversions Z23** 

**Rerating Lamps Z24** 

Use of Ballast Resistor Z25

Recommended Resistors for LEDs Z25

**Lamp Specifications Z26** 

**Electrical Data Z28** 

Glossary Z29

Elements/Federal Supply Code Number Z34

**Index by Model Number Z35** 

Illustrated Contents by Product Sequence Z40

Color Codes: A Black **B** White C Red **D** Orange E Yellow F Green G Blue H Grav J Clear

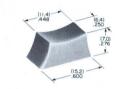
Finishes: Customers should contact the factory when desiring a finish other than standard for an accessory. The following codes are used for some accessories: 3 Black 4 Bright chrome 5 Satin chrome 6 Bright nickel 7 Dull nickel 8 Zinc plating 9 Brushed aluminum

Even though standard colors, finishes, etc. are described in the Accessories section, the customer can rely on NKK's accommodation to special needs. Simply contact the factory when an application calls for legends on caps, variations in color, or any other custom feature on an accessory.

#### AT055 **Crossover Guard** Polypropylene Series: KB



#### AT062 .250" Wide Rocker Nylon Colors: A B C E F G



#### AT063 **Dust Cover** Silicone rubber

Series: M



#### AT0641 & AT0642 Panel Frame for Rocker &



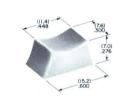
AT0651 & AT0652 Panel Frame for Rocker & Paddle .453" Wide



AT066

Series: A

.300" Wide Rocker Nylon Colors: A B C E F G Series: A



**AT070** 

LED for AT208 Bezel Color: C F Series: EB M MB PW



**AT076** 

Cap for Locking Lever (code L1) Bright nickel Brushed or colored aluminum Colors: A C G Series: MP



**AT077** Single Pole Right Angle PC





### **AT078**

.315" Dia. Screw-on Cap Polystyrene Colors: A B C E F G H Series: MB SCB



### **AT079**

.394" Dia. Screw-on Cap Polystyrene Colors: A B C E F G H Series: MB SCB

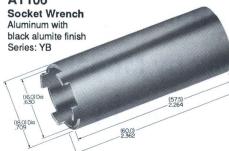


#### AT105

Cap Removal Tool Stainless steel Series: YB



#### AT106



### AT107

Lamp Extractor Polyvinyl chloride Series: KB LB LW MLW YB



# AT108 **Socket Wrench** Aluminum Series: KB



AT201



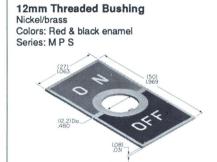
AT110

**Socket Wrench** 









AT202 ON-OFF Plate for

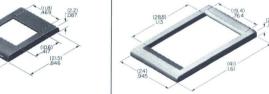
# **AT204** Bezel Polycarbonate Colors: A B C D E F G H Series: MLW





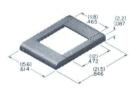
AT207 Bezel Polycarbonate Colors: A B C E F G H Series: EB M MB M21 PW



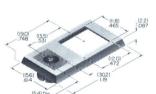


**AT206** 

Bezel



**AT208** Bezel with AT070 LED Polycarbonate Color: A Series: EB M MB PW



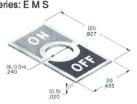
**AT209 ON-OFF Plate for 6mm** Threaded Bushing Nickel/brass Series: EMS



AT210 **ON-OFF Plate for 6mm** Threaded Bushing Nickel/brass Colors: Red & black ink Series: E M S



**AT211** ON-OFF Plate for 6mm **Threaded Bushing** Nickel/brass Colors: Red & black enamel Series: EMS



AT212 Bezel with 2 AT617 LEDs Polycarbonate Color: A Series: EB M MB PW



AT213 Bezel with 2 AT618 LEDs Polycarbonate Color: A Series: EB M MB PW



AT214 ON-OFF Plate for 12mm Threaded Bushing Nickel/brass Colors: Red & black ink Series: MPS

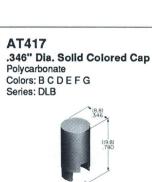


### **AT217 AT218** AT215 ON-OFF Plate for 12mm Threaded Bushing **Small Bezel** Large Bezel Polyamide Polyamide Nickel/brass Colors: A B H Colors: A B H Colors: Red & black enamel Series: JWL Series: JWM Series: MPS **AT401 AT402** Splashproof Cap **Waterproof Boot** Nitrile butadiene rubber Silicone rubber Series: M P S Colors: A H Series: MPS (19.3) AT402C **AT405 AT406** Solid Colored Rocker **Bat Lever Cap Waterproof Boot** Polyvinyl chloride Silicone rubber Polycarbonate Series: M Colors: ABCDEFG Colors: A B C E F G Series: MLW Series: MPS (18.0) Dia **AT407** AT412 AT413 .394" Dia. Screw-on Cap .748" Dia. Screw-on Cap .315" Dia. Screw-on Cap Polystyrene Colors: A B C F Series: MB SCB momentary Polystyrene Polystyrene Colors: ABCEFGH Colors: A B C E F G H Series: MB Series: MB M3.5 PO.6 **AT414** AT415 AT416 AT417 .520" Dia. Screw-on Cap **Bat Lever Cap** Lamp Cover for AT602 Polystyrene Polyethylene Polycarbonate Silicone rubber Colors: A B C D E F G H Colors: A B C E F G Colors: C D F Series: MB SB SCB Series: E M M2T Series: LW Series: DLB









(18.0) Dia

# **ACCESSORIES**

### **AT418**

.512" Dia. Solid Colored Cap

Polycarbonate Colors: B C D E F G Series: DLB



**AT419** .748" Sq. Solid Colored Cap

Polycarbonate Colors: B C D E F G Series: DLB



**AT420** 

Rocker Polycarbonate Colors: B J



AT421

Filter for AT420 Polycarbonate

Colors: BCDEFG Series: LW



**AT422** 

Slip-on Cap

Polyethylene Colors: A B C E F G

Series: SB4011



**AT423** 

Mushroom Cap

Polyamide

Colors: A Series: SB282 MB



**AT426** 

Solid Colored Paddle

Polycarbonate Colors: A B C D E F G

Series: MLW



AT427 Cap for Locking Lever (code L)

Bright nickel Brushed or colored aluminum

Colors: A C G Series: MP



AT428 (M-metric H-inch)

**Waterproof Boot** Silicone rubber

Color: A Series: EMP



AT429

**Indicator Cap** 

Polycarbonate

Colors: B C D E F G



Series: MLW

### AT431 Large Rotary Knob

Phenolic resin Color: A

Series: HS PS TS



### AT432 Small Rotary Knob

Phenolic resin Color: A

Series: HS PS TS



### **AT433**

**Knob for Miniature Rotaries** 

Polyacetal

Color: A



### **AT434**

**Bat Lever Cap** Polyvinyl chloride

Colors: A B C E F G

Series: M



# **AT435**

Screw-on Cap

Chrome/brass Series: SB

AT436 Paddle

Polycarbonate Colors: A B C E F G H

Series: PW



**AT437** 

Rocker

Polycarbonate

Colors: A B C E F G H Series: PW



AT438 Design Rocker

Polycarbonate

Colors: B C D F G

Series: MLW



**AT439** Round Snap-on Cap Polycarbonate Colors: A B C F Series: SDB



**AT440** Square Snap-on Cap Polycarbonate



**AT441** Cap for Color Tipped Column Lever Polypropylene Colors: A B C E F G Series: M



**AT442** .394" Dia. Snap-on Cap

Polycarbonate Colors: A B C E F G H Series: EB M2B MB



**AT443** 

.315" Dia. Snap-on Cap Polycarbonate Colors: A B C E F G H Series: EB M2B MB



AT444

**Bat Lever Conical Cap** Polyethylene Colors: A B C E F G Series: E M M2T



**AT445** 

**Cap for Color Tipped** Cone Toggle Polycarbonate Colors: A B C E F G



**AT446** 

.748" Dia, Round Design Cap Polycarbonate

Colors: B C F G Series: DLB

### **AT448**

.365" Wide Rocker Polycarbonate

Colors: ABCEFGH Series: M



### **AT449**

.365" Wide Paddle

Polycarbonate Colors: A B C E F G H Series: M



Series: M



### **AT450**

.453" Wide Rocker Polycarbonate

Colors: A B C E F G H Series: M



### AT451

.453" Wide Paddle

Polycarbonate Colors: A B C E F G H Series: M



### AT452

Rectangular Insert

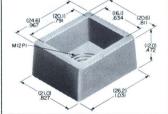
Polycarbonate Colors: A B C F G H Series: MB SCB

Used with Screw Adaptor AT080



### AT453 Rectangular Shroud

Polycarbonate Colors: A B H Series: MB SCB



### AT454

**Round Insert** Polycarbonate

Colors: A B C F G H Series: MB SCB



Used with Screw Adaptor AT080

### AT455

**Round Shroud** Polycarbonate

Colors: A B H Series: MB SCB



### **AT456**

.598" Wide Rocker Polycarbonate Colors: A B C E F G H

Series: M P



### AT457 .598" Wide Paddle

Polycarbonate Colors: A B C E F G H

Series: MP



### **AT458** Paddle

Polycarbonate Colors: A B C E F G H Series: PW



**AT460** 

Long Plastic Toggle Tip Polyethylene Colors: A B C E F G Series: M



AT461 .476" Wide Paddle

Polycarbonate Colors: A B C E F G H Series: M M2T



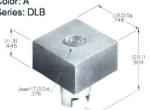
AT462

**Spot Illuminated Rocker** Polycarbonate Color: A Series: MLW



AT463 .748" Square Spot Illuminated Cap with LED Polycarbonate

Color: A Series: DLB



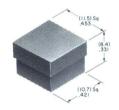
AT464 .748" Dia. Round Spot

Illuminated Cap with LED Polycarbonate



AT465 Pushbutton Cap

Polycarbonate Colors: A B C E F G H Series: EB MB



**AT466** 

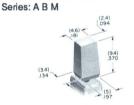
.453" False Illuminated Rocker

Polycarbonate Color: A with B/C Series: M



**AT467 Short Paddle** 

Nylon Colors: A B C E F G H



**AT468** 

Long Paddle

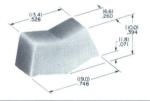
Nylon Colors: A B C E F G H Series: A B M



**AT469** 

.260" Wide Rocker Polyamide

Colors: A B C E F G H Series: A



AT475

.201" Dia. Cap Polycarbonate Colors: A B C

Series: AB BB FB M2B MB



**AT476** 

**Square Solid Colored Cap** Polycarbonate

Colors: B C E F G Series: LB



**AT477** 

Square Colored Insert Cap

Polycarbonate Colors: BCEFG Series: LB



**AT478** 

Square Cap for LED

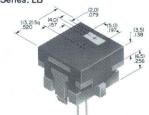
Polycarbonate Colors: BCEF Series: LB



### **AT480**

Square Spot Illuminated Cap

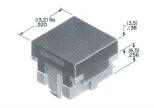
Polycarbonate Colors: A B C F CF Series: LB



### **AT484**

Square Nonilluminated Cap Polycarbonate

Colors: A B C E F G H Series: LB



Series: KB

### AT485 **Square Solid Colored Cap** Polycarbonate

Colors: A B C E F G Series: KB



### **AT486 Round Solid Colored Cap** Polycarbonate Colors: ABCEFG

(11.6) Dia

### **AT487**

**Square Colored Insert Cap** 

Polycarbonate Colors: B C E F G Series: KB



### **AT488**

**Round Colored Insert Cap** 

Polycarbonate Colors: B C E F G Series: KB



### **AT489**

**Square Cap for LED** 

Polycarbonate Colors: B C E F Series: KB



### **AT490**

**Round Cap for LED** 

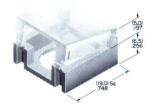
Polycarbonate Colors: B C E F Series: KB



### **AT494**

**Protective Guard** 

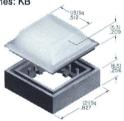
Polycarbonate & polyamide Series: KB



### AT495

Splash Cover Polyvinyl chloride & polyamide

Series: KB



### **AT496**

.295" Dia. Cap

Polycarbonate Colors: A B C

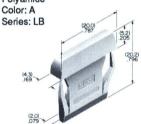
Series: AB BB FB M2B MB



### **AT497**

**End Barrier** 

Polyamide



### **AT498**

Center Barrier

Polyamide Color: A



### **AT499**

**Protective Guard** 

Polycarbonate & polyamide Series: LB



### **AT517**

Mounter for Square Cap

Fiberglass reinforced nylon Color: A

Series: DLB

### **AT528**

Mounter for Round Cap Fiberglass reinforced nylon

Color: A Series: DLB MB



### AT529

Mounter for Square Cap

Stainless steel frame Brass spacer Series: EB

### AT530 **Panel Mount for Single Pole** Polycarbonate Colors: A B C E F G H Series: A AB



### **AT531**

Panel Mount for Single or Double Pole

Polycarbonate Colors: A B C E F G H

Series: A AB



# **R** ACCESSORIES

### AT602 Incandescent Lamp Volts: 6 12 18 24 28

Series: LW MLW T-1 1/2 Pilot Slide Base



AT602N Neon Lamp

Volts: 110 Series: LW MLW T-1 1/2 Pilot Slide Base



AT604 Incandescent Lamp

Volts: 6 14 28 Series: DLB T-1 3/4 Midget Groove Base



AT604N Neon Lamp

Volts: 110 Series: DLB T-1 3/4 Midget Groove Base



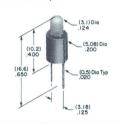
AT606 Single Element LED

Colors: C F Series: MLW T-1 1/2 Pilot Slide Base



AT607 Incandescent Lamp

Volts: 5 12 28 Series: LB T-1 Standard Bi-pin



AT607N Neon Lamp

Volts: 110 Series: LB T-1 Standard Bi-pin



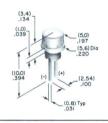
AT611 Incandescent Lamp

Volts: 5 12 28 Series: KB YB T-1 Standard Bi-pin



AT612 Double Element LED

Colors: C E F Series: KB T-1 1/2 Cylindrical



AT614 Single Element LED

Colors: C E F Series: KB LB T-1 1/2 Cylindrical



AT615 Neon Lamp

Volts: 110 Series: KB T-1 Standard Bi-pin



AT616 Single Element LED

Colors: C E F Series: HB



AT617 Single Element LED

Colors: C E F Used for AT212 Bezel



AT618 Single Element LED Colors: C E F

Used for AT213, AT480, & AT4016



### AT620

4-element Single Color LED Colors: C E F Series: YB

T-1 1/2 Standard Bi-pin



AT621

6-element Bicolor LED

Colors: CF Series: YB

T-1 1/2 Standard Bi-pin







### AT701 Single Pole Straight PC Adaptor Fiberglass reinforced polyamide Series: KB



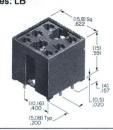
AT702 Double Pole Straight PC Adaptor Fiberglass reinforced polyamide Series: KB



AT711 Single Pole Straight PC Adaptor Fiberglass reinforced polyamide Series: LB

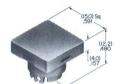


AT712 Double Pole Straight PC Adaptor Fiberglass reinforced polyamide Series: LB



### AT3001 Square Solid Cap

Polycarbonate Colors: BCEFG Series: YB



### AT3002

**Round Solid Cap** Polycarbonate Colors: BCEFG Series: YB



### AT3003

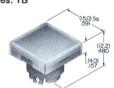
Rectangular Solid Cap Polycarbonate Colors: BCEFG Series: YB



### AT3004

Square LED Cap

Polycarbonate Colors: JB JC JE JF Series: YB



### AT3005

Round LED Cap Polycarbonate

Colors: JB JC JE JF Series: YB



### AT3006

Rectangular LED Cap

Polycarbonate Colors: JB JC JE JF Series: YB

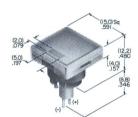




### AT3010 Square Spot Illuminated Cap with Built-in LED

Polycarbonate LED Colors: C E F CF Voltages: 02 05 12 24

Insert Colors: ABCEF Series: YB



### AT3011 Round Spot Illuminated Cap with Built-in LED

Polycarbonate LED Colors: C E F CF Voltages: 02 05 12 24

Insert Colors: ABCEF



### AT3012 Rectangular Spot Illuminated Cap with Built-in LED

Polycarbonate LED Colors: C E F CF Voltages: 02 05 12 24

Insert Colors: ABCEF Series: YB



### AT3021

Flat Cap for Barrier Flange Material: Polyphenylene oxide

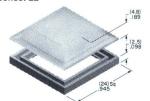
Colors: ABCH Series: JP



### AT4001

**Square Splash Cover** Polyvinyl chloride & polyethylene

Series: LB



### AT4002

**Round Splash Cover** Polyvinyl chloride & polyethylene Series: LB





### AT4003

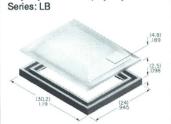
.394" Bat Lever Cap Polyvinyl chloride

Colors: A B C Series: A B



AT4011

Rectangular Splash Cover Polyvinyl chloride & polyethylene



AT4012

Round Solid Colored Cap

Polycarbonate Colors: B C E F G Series: LB



AT4013

**Round Colored Insert Cap** 

Polycarbonate Colors: BCEFG



AT4014

**Round Cap for LED** 

Polycarbonate Colors: B C E F



AT4016

**Round Spot Illuminated Cap** 

Polycarbonate Colors: A B C F CF



AT4017

**Round Nonilluminated Cap** 

Polycarbonate Colors: A B C E F G H

Series: LB



AT4021

Rectangular Solid Colored Cap

Polycarbonate Colors: A B C E F G Series: KB



AT4022

Rectangular Colored Insert Cap

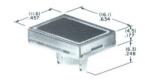
Polycarbonate Colors: B C E F G Series: KB



AT4023

Rectangular Cap for LED

Polycarbonate Colors: B C E F Series: KB



AT4024

**Protective Guard** 

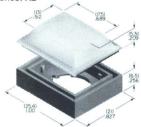
Polycarbonate & polyamide Series: KB



AT4025 Rectangular

Splash Cover

Polyvinyl chloride & polyamide Series: KB



AT4026

Rectangular Solid Colored Cap

Polycarbonate Colors: BCEFG Series: LB



AT4027

Rectangular Colored Insert Cap

Polycarbonate Colors: B C E F G Series: LB



AT4028

Rectangular Cap for LED

Polycarbonate Colors: B C E F



AT4030 Rectangular Cap for Nonilluminated

Polycarbonate

Colors: A B C E F G H Series: LB

AT4031 Square Transparent Cap for LED

Polycarbonate Colors: B C E F

Series: HB



### AT4032 Round Transparent Cap for LED

Polycarbonate Colors: B C E F Series: HB



### AT4033

**Square Indicator Cap** Polycarbonate Colors: B C E F Series: HB



### AT4034

**Round Indicator Cap** Polycarbonate

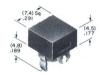
Colors: B C E F Series: HB



### AT4035

**Square Nonilluminated Cap** 

Polycarbonate Colors: A B C E F G Series: HB



### AT4036

**Round Nonilluminated Cap** 

Polycarbonate Colors: B C E F G Series: HB



### AT4041 (M-metric H-inch) **Waterproof Boot for Momentary**

Silicone rubber Series: MB



### AT4042 (M-metric H-inch) Waterproof Boot for Alternate

Silicone rubber

Series: MB



### AT4043 Waterproof Boot

Silicone rubber Series: MB



# AT4051

**Spot Illuminated Cap** 

Polycarbonate Color: A Series: KB



### AT4052

Spot Illuminated Cap

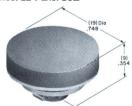
Polycarbonate Color: A Series: HB



### AT4054

Round Solid Colored Cap

Polycarbonate Colors: B C E F G Series: LB Panel Seal



### AT4055

Round Colored Insert Cap

Polycarbonate Colors: B C E F G Series: LB Panel Seal



### AT4056

Round Cap for LED

Polycarbonate Colors: C E F Series: LB Panel Seal

### AT4057

**Protective Guard** 

Polycarbonate Series: LB

### AT4058 Nonilluminated Sculptured Cap

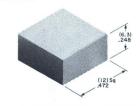
Polyamide Colors: ABCEFGH

Series: JB

### AT4059

Nonilluminated Flat Cap

Polycarbonate Colors: A B C E F G H Series: JB



### AT4060

Clear Cap w/Colored Diffuser

Polycarbonate Colors: B C E F Series: JB



# AT4061

# Snap-in Knob

Polycarbonate Color: A with J Series: DR



### AT4062

Rocker Polyamide



### AT4063

.157" Dia. Slip-on Cap

Polyamide Color: A B C Series: GB



### AT4064

.248" Bat Lever Cap

Polyvinyl chloride Color: C Series: A B



### AT4065

Slide Cap

Polycarbonate Window: CEF Cap: A

Series: SS



### AT4072 Protective Guard

Lid: Polycarbonate

Base: Glass Fiber Reinforced

Polycarbonate

Series: YB

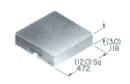


### AT4073 Square Opaque Cap for Nonilluminated

Polycarbonate

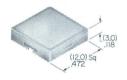
Colors: B C E F G

Series: UB



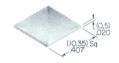
### AT4074 Square Transparent Cap for Illuminated

Polycarbonate Colors: CEFJ Series: UB



### AT4075 Diffuser for AT4074 Square Cap

Polycarbonate Colors: B C E F Series: UB



### AT4079 **Actuator Key**

Bright nickel/brass

Series: SK PCB Mount



### AT4080

**Actuator Key** 

Bright nickel/brass with ABS resin handle

Color: A

Series: SK PCB Mount



### AT4081

**Actuator Kev** 

Chrome/zinc alloy Series: SK 2-position, Bushing Mount



### AT4082

**Actuator Key** Chrome/zinc alloy

Series: SK 3-position, Bushing Mount



### AT4103

Short Color Tipped Knob Polyester w/polyamide tip

Base Color: A

Tip Colors: A B C E F G H

Series: DRA MR



### AT4104

Long Color Tipped Knob Polyester w/polyamide tip

Base Color: A

Tip Colors: A B C E F G H

Series: DRA MR

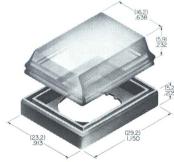


### AT4115

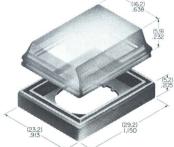
Splash Cover

Lid: Polyvinyl chloride

Series: YB



Base: Polyamide



**witches** • 7850 E. Gelding Dr. • Scottsdale, AZ 85260 • Phone (602) 991-0942 • Fax (602) 998-1435

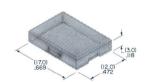
# AT4116 Rectangular Opaque Cap for Nonilluminated

Polycarbonate Colors: B C E F G Series: UB



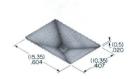
AT4117 Rectangular Transparent Cap for Illuminated Polycarbonate

Colors: C E F J Series: UB



### AT4118 Diffuser for AT4117 Rectangular Cap

Polycarbonate Colors: B C E F Series: UB



### AT4119 Square **Spot Illuminated Cap**

Polycarbonate with matte finish Colors: A Series: UB



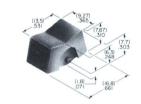
### AT4120 Rectangular Spot Illuminated Cap

Polycarbonate with matte finish Colors: A Series: UB



# AT4148 .365" Wide Rocker

Nylon Colors: A B C E F G H Series: M M2T



### AT4149 .365" Wide Paddle

Nylon

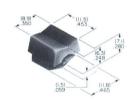
Colors: A B C E F G H Series: M M2T



### AT4150 .453" Wide Rocker

Nylon

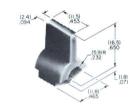
Colors: A B C E F G H Series: M M2T P



### AT4151 .453" Wide Paddle

Nylon

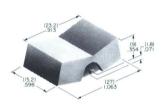
Colors: A B C E F G H Series: M M2T P



# AT4156 .598" Wide Rocker

Nylon

Colors: A B C E F G H Series: M M2T P



# AT4157 .598" Wide Paddle

Nylon

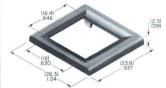
Colors: A B C E F G H Series: M M2T P



### AT9201

Bezel

Polycarbonate Colors: A B C D E F G H Series: MLW

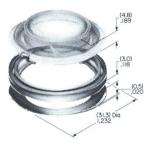


### AT9410

**Round Splash Cover** 

Lid: Polyvinyl chloride Base: Polyethylene

O-ring: Nitrile butadiene rubber Series: LB Panel Seal



# **NKK** HARDWARE

Many hardware pieces are available in both metric and inch threading, and in such cases M (metric) and H (inch) are noted in the descriptions below. The customer must select threading by placing an M or H after the basic AT part number. If the hardware is available only in metric or inch, no code is used in the description; the drawing designates the threading.

Standard materials are shown in the descriptions. All of the nickel and chrome platings are bright finishes. The following codes should be used for ordering optional finishes and materials: 3 Black 4 Bright chrome 5 Satin chrome 6 Bright nickel 7 Dull nickel 8 Zinc plating 9 Brushed aluminum. Contact the factory for availability of these custom finishes and materials.



# **NKK** HARDWARE



# **NKK** HARDWARE

		AT532 (M-metric H-inch) Dress Cap Nut Nickel/brass	AT532T (M-metric H-inch) Threaded Through Dress Nut Nickel/brass  M6 P0.75 or 1/4-40 Thd (8.9) (9.5) Dio .374
AT533T (M-metric H-inch) Threaded Through Dress Nut Nickel/brass	AT535 Washer for MR Panel Seal Nitrile butadiene rubber (NBR) Series: MR	AT536 Hex Nut for FB Nickel/brass Series: FB	AT537 O-ring Nitrile butadiene rubber (NBR) Series: MTL
M6 P0.75 or 1/4-40 Thd (12) Dia .472 (13.1) (2.3) .090	(6.2)Dig 244 (9.4)Dig 3.370	(1,2) <sup>1</sup> (1,2) <sup>1</sup> (1,2) <sup>1</sup> (8,0) (8,0)	(12.5)Dia .492 (15.5)Dia .610
	AT541 O-ring for Panel Seal with Splash Cover Nitrile butadiene rubber (NBR) Series: YB		
	(6,50) Dia (50,0) Dia (787)		

### **UNDERWRITERS LABORATORIES INC. FILE E44145**

**Important** 

Switches are supplied without UL marking unless specified. To order UL mark on switch, add a /U to end of part number.

Symbol used below: + = any following #s or letters.

Underwriters Laboratories Inc. is an independent, nonprofit organization engaged in testing for the public safety. Address: 1655 Scott Boulevard Santa Clara, California 95050.

SERIES	POLE & THROW	RATING	SERIES	POLE & THROW	RATING
DLB214+	DPDT	5A @ 125V AC	MB2+	SPDT	6A @ 125V AC, 3A @ 250V AC
E201+	SPST SPDT	3A @ 125V AC	(MB2000)	DPDT 4PDT	0.4VA @ 28V AC/DC
E202+	DPST DPDT	3A @ 125V AC	MB24+ (MB2400)	SPDT DPDT	3A @ 125V AC 0.4VA @ 28V AC/DC
EB0011		04 0 4051/40	MLW302+	DPDT	5A @ 125V AC
EB2011 EB2061 EB2065	SPDT DPDT SPDT	3A @ 125V AC	MRT2+	DPDT	5-10A @ 125V AC
EB2085	DPDT	No. of	MS+	SPDT DPDT	6A @ 125V AC, 3A @ 250V AC 0.4VA @ 28V AC/DC
FBANP2 FBANEP2	SPST	500mA @ 125V AC			(nonilluminated models only)
HB+	SPDT	0.1A @ 30V AC/DC	P20+	SPST SPDT DPST	10A @ 125V AC, 6A @ 250V AC
HS16	SP ~ 6P	12A @ 125V AC, 6A @ 250V AC		DPDT	
JWL	SPST SPDT DPST	16A @ 250V AC	PW201+	SPDT	6A @ 125V AC (for PW2012) 5A @ 125V AC (for all others)
	DPDT		PW202+	DPDT	6A @ 125V AC (for PW2022) 5A @ 125V AC (for all others)
JWM	SPST SPDT DPST	10A @ 250V AC	S1A	SPST	15A @ 125V AC, 6A @ 250V AC
	DPDT		S1B	SPST	10A @ 125V AC, 5A @ 250V AC
KB+	SPDT DPDT	1A @ 125/250V AC, 1A @ 30V DC 0.4VA @ 28V AC/DC	S2A	SPDT	15A @ 125V AC, 6A @ 250V AC
LB+	SPDT	3A @ 125/250V AC	S2B	SPDT	10A @ 125V AC, 5A @ 250V AC
LDT	DPDT	0.4VA @ 28V AC/DC	S3A	SPDT	15A @ 125V AC, 6A @ 250V AC
LW312+	DPDT	10A @ 125V AC, 6A @ 250V AC	S6A	DPDT	20A @ 125V AC, 10A @ 250V AC
M+ or M20+	SPST SPDT	6A @ 125V AC, 3A @ 250V AC 0.4VA @ 28V AC/DC	S6B	DPDT	10A @ 125V AC, 5A @ 250V AC
Toggles	SP3T DPST	0.4VA @ 26V AO/DO	S7B	DPDT	5A @ 125V AC, 3A @ 250V AC
	DPDT DP3T		S31+	3PST	18A @ 125V AC, 9A @ 250V AC
	3PDT 4PDT		S32+	3PDT	18A @ 125V AC, 9A @ 250V AC
M+ or	SPDT	6A @ 125V AC, 3A @ 250V AC	S33+	3PDT	18A @ 125V AC, 9A @ 250V AC
M20+ Rockers	SP3T DPDT	0.4VA @ 28V AC/DC	S35+	3PDT	15A @ 125V AC, 6A @ 250V AC
. 1001.010	DP3T 3PDT		S38+	3PDT	15A @ 125V AC, 6A @ 250V AC
	4PDT		S39+	3PDT	15A @ 125V AC, 6A @ 250V AC
M211+	SPDT	6A @ 125V AC	S41+	4PST	18A @125V AC, 9A @ 250V AC
M2B	SPDT DPDT	1A @ 125V AC, 1A @ 30V DC 0.4VA @ 28V AC/DC	S42+	4PDT	18A @125V AC, 9A @ 250V AC
M2T+	SPDT DPDT	6A @ 125V AC, 3A @ 250V AC 4A @ 30V DC 0.4VA @ 28V AC/DC	S43+	4PDT	18A @125V AC, 9A @ 250V AC

# **NKK** UL RECOGNITION

	UNDERWRITERS LABORATORIES INC. FILE E44145										
SERIES	POLE & THROW	RATING	SERIES	POLE & THROW	RATING						
S45+	4PDT	15A @125V AC, 6A @ 250V AC	S8+ (S830Ds)	3PST 3PDT	30A @ 30V DC, 15A @ 125V D						
S48+	4PDT	15A @125V AC, 6A @ 250V AC	(3630Ds) S4012	SPDT	6A @ 125V AC						
S49+	4PDT	15A @125V AC, 6A @ 250V AC	SB25	DPDT							
S301+	SPST	15A @ 125V AC, 6A @ 250V AC			15A @ 125V AC, 9A @ 250V AC						
S302+	SPDT	15A @ 125V AC, 6A @ 250V AC	SB61A	DPDT	10A @ 125V AC, 5A @ 250V AC						
S303+	SPDT	15A @ 125V AC, 6A @ 250V AC	SB265 SB265T	SPST SPST	6A @ 125V AC, 3A @ 250V AC 6A @ 125V AC, 3A @ 250V AC						
S331+	DPST	15/25A @ 125V AC	SB285	DPDT	6A @ 125V AC, 3A @ 250V AC						
S332+	DPDT	15/9A @ 250V AC 15/25A @ 125V AC 15A @ 250V AC	SB401+ (SB4011NO	SPST & SB4011NC)	3A @ 125V AC						
0000	DDDT		SK+	SPDT	3A @ 125V AC, 1A @ 250V AC						
S333+	DPDT	15/25A @ 125V AC 15A @ 250V AC	SW300+ (SW3001A)	SPST	15A @ 125V AC, 6A @ 250V AC						
S335+	DPDT	15A @ 125V AC 6A @ 250V AC	SW300+ (SW3002A 8	SPDT	15A @ 125V AC, 6A @ 250V AC						
S338+	DPDT	15A @ 125V AC 6A @ 250V AC	SW3003A)								
S339+	DPDT	15A @ 125V AC 6A @ 250V AC	SW300+ (SW3006A)	DPDT	20A @ 125V AC, 10A @ 250V AC						
S8+ (S820s)	DPST DPDT	30A @ 125V AC 30A @ 250V AC	SW38+ (SW3800s SW3800Ds)	DPST DPDT 3PST 3PDT	30A @ 125/250V AC 15A @ 125V DC 30A @ 30V DC						
S8+ (S830s)	3PST 3PDT	30A @ 125V AC, 30A @ 250V AC	UB+	SPDT DPDT	5A @ 125/250V AC 0.4VA @ 28V AC/DC						
S8+ (S820Ds)	DPST DPDT	30A @ 30V DC, 15A @ 125V DC	YB+	SPDT DPDT	3A @ 125/250V AC 0.4VA @ 28V AC/DC						

# **NKK** CSA CERTIFICATION

### CANADIAN STANDARDS ASSOCIATION FILE LR23535 & LR56017

**Important** 

Switches are supplied without CSA marking unless specified. To order CSA mark on switch, add a /C to end of part number. Abbreviations used below: X = circuit #s,

PC = printed circuit board, WW = wirewrap, QC = quick connect.

Canadian Standards Association is a nonprofit, nongovernmental association which investigates equipment safety & certifies use of CSA marks when a product is in compliance with applicable requirements. Address: 178 Rexdale Blvd. Rexdale (Toronto) Ontario, Canada M9W1R3.

(Totolio) Olitalo, Callada Wey Tho.						
POLE THROW	RATING					
4PDT	6A @ 125V AC, 3A @ 250V AC 0.4VA @ 28V AC/DC (PC, Solder Lug, WW, QC)					
SPDT	3A @ 250V AC 0.4VA @ 28V AC/DC					
DPDT	(PC, Solder Lug, WW) 3A @ 250V AC					
5, 5,	0.4VA @ 28V AC/DC (PC & WW only)					
DPDT	5A @ 125V AC, 3A @ 250V AC					
SPDT SP3T DPDT	6A @ 125V AC, 3A @ 250V AC 0.4VA @ 28V AC/DC (nonilluminated models only)					
SPST SPDT	10A @ 125V AC 6A @ 250V AC					
DPST DPDT	10A @ 125V AC 6A @ 250V AC					
SPDT	6A @ 125V AC					
SPDT	5A @ 125V AC					
DPDT	6A @ 125V AC					
DPDT	5A @ 125V AC					
SPST	15A @ 125V AC, 6A @ 250V AC					
SPST	10A @ 125V AC, 5A @ 250V AC					
SPDT	15A @ 125V AC, 6A @ 250V AC					
SPDT	15A @ 125V AC, 6A @ 250V AC					
DPDT	20A @ 125V AC, 10A @ 250V AC					
DPDT	10A @ 125V AC, 5A @ 250V AC					
DPDT	20A @ 125V AC, 10A @ 250V AC					
DPDT	5A @ 125V AC, 3A @ 250V AC					
3PST	25A @ 125V AC, 9A @ 250V AC					
3PDT	25A @ 125V AC, 9A @ 250V AC					
	3PST					

# **NKK** CSA CERTIFICATION

	CAN	ADIAN STANDARDS ASSOCI	IATION FILE LR23535 & LR56017							
SERIES	POLE THROW	RATING	4	SERIES	POLE THROW	RATING				
S33 S33F	3PDT	25A @ 125V AC, 9A @ 250V AC		SB4011NC SB4011NO	SPST	3A @ 125V AC, 2A @ 250V AC				
S33T		15A @ 125V AC, 6A @ 250V AC		SK	SPDT	3A @ 125V AC, 1A @ 250V AC				
S35	3PDT	15A @ 125V AC, 6A @ 250V AC		SW3001A	SPST	15A @ 125V AC, 6A @ 250V AC				
S38	3PDT	15A @ 125V AC, 6A @ 250V AC		SW3002A SW3003A	SPDT					
S39	3PDT	15A @ 125V AC, 6A @ 250V AC		SW3006A	DPDT	20A @ 125V AC, 10A @ 250V AC				
S41	4PST	25A @125V AC, 9A @ 250V AC		SW3007A	DPDT	15A @ 125V AC, 6A @ 250V AC				
S42 S43	4PDT			SW3116	DPDT	5A @ 125V AC, 2A @ 250V AC				
S41T	4PST	15A @125V AC, 6A @ 250V AC		SW3211	SPST	3A @ 125V AC, 1.5A @ 250V AC				
S42T S43T	4PDT			SW382X	DPST DPDT	30A @ 125/250V AC				
S114 S116	DPST DPDT	5A @ 125V AC, 2A @ 250V AC		SW383X	3PST 3PDT	30A @ 125/250V AC				
S211	SPST	3A @ 125V AC, 1.5A @ 250V AC		SW382X	DPST	30A @ 30V DC, 15A @ 125V DC				
S301 S302	SPST SPDT	15A @ 125V AC, 6A @ 250V AC		w/suffix D	DPDT					
S303 S305 S308				SW383X w/suffix D	3PST 3PDT	30A @ 30V DC, 15A @ 125V DC				
S309	~ S309 with su	uffix F or T at same ratings		UB	SPDT DPDT	5A @ 125/250V AC, 5A @ 30V DC				
S331 S332 S333	DPST DPDT	25A @ 125V AC, 9A @ 250V AC		YB	SPDT DPDT	3A @ 125/250V AC 0.4VA @ 28V AC/DC				
S335	DPDT	15A @ 125V AC, 6A @ 250V AC								
S532 S533	DPDT	30A @ 125V AC, 15A @ 250V AC								
\$821 \$822 \$823	DPST DPDT	30A @ 125/250V AC								
S831 S832 S833	3PST 3PDT	30A @ 125/250V AC								
S821D S822D S823D	DPST DPDT	30A @ 30V DC, 15A @ 125V DC								
S831D S832D S833D	3PST 3PDT	30A @ 30V DC, 15A @ 125V DC								
SB25	DPDT	15A @ 125V AC, 9A @ 250V AC								
SB221NC SB221NO SB221TNC SB221TNO	SPST	3A @ 125V AC, 1.5A @ 250V AC								
SB265 SB265T	SPST	6A @ 125V AC, 3A @ 250V AC								

NKK, a pioneer in the development of washable switches, is ahead of its time as a manufacturer of process sealed switches, which are increasingly in demand because of the advancements in automated PC board processing. NKK's expansive family of washables includes miniature, subminiature, super-subminiature, and micro-subminiature toggles, rockers, pushbuttons, keypads, rotaries, and keylocks.

Over 40 years of quality design experience produced the first washable switches to satisfy the process requirements of PC board soldering and cleaning techniques. As each section of this catalog shows, our process compatible switches incorporate all the features necessary to accomplish washability: epoxy sealed terminals, heat resistant resins, interior rubber o-rings, seals, and sleeves, plus ultrasonic welding. NKK's washable switches meet the Flourinert 85°C (185°F), 60-second immersion test. The following data, along with details given in individual sections of this catalog, have been developed from a comprehensive study of test data, technical literature, and industry practice.

### **General Processing Specifications**

Flux Type Strongly recommended are synthetic fluxes that can be effectively removed with alcohol based solvents. Water soluble flux can be used only if a mild spray wash is used.

Preheat It is advisable that temperatures not exceed 104°C (220°F) for 1 minute maximum.

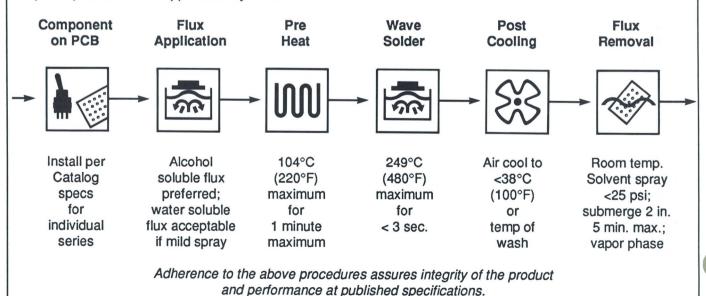
The solder wave should not be greater than 249°C (480°F), and component travel time Wave Soldering through the wave should be less than 3 seconds.

Post-wave Cooling To avoid or minimize thermal shock, switches should be allowed to air cool to below 38°C (100°F) or to the temperature of the cleaning liquid prior to being washed.

Cleaning Solution Alcohol based solutions are most recommended. Aqueous solutions may be used to remove water based flux only if the method of application is a low pressure spray (less than 25 psi) at less than 52°C (125°F) for 5 minutes maximum.

Cleaning Specifications Room temperature. Low pressure spray (less than 25 psi). Submersion depth of 2 inches for maximum time of 5 minutes acceptable if necessary. Vapor cleaning acceptable but not to exceed the time for the switch to reach vapor temperature equilibrium.

Drying In order to eliminate any condensation formed on surfaces after the cleaning process, dry at 52°C (125°F) maximum for approximately 1 hour.



# **NKK** CONVERSIONS

TEMPERATURE										
(Fahrenheit - 32) X .555 = Centigrade	°C	°F	°C	°F	°C	°F				
(Centigrade X 1.8) + 32 = Fahrenheit	-25	-13	+15	+59	+60	+140				
	-20	- 4	+20	+68	+65	+149				
Fahrenheit - thermometric scale with fixed points marked 32°F (freezing) and 212°F	-17.78	0	+25	+77	+70	+158				
	-15	+5	+30	+86	+75	+167				
(boiling).	-10	+14	+35	+95	+80	+176				
	-5	+23	+40	+104	+85	+185				
Centigrade - thermometric scale divided into 100 degrees with 0°C freezing point and 100°C boiling point; same as Celsius.	0	+32	+45	+113	+90	+194				
	+5	+41	+50	+122	+95	+203				
	+10	+50	+55	+131	+100	+212				
bolling point; same as Celsius.	+10	+50	+55	+131	+100	+212				

LINEAR DIMENSIONS												
Fraction	Inch	Millimeter	Fraction	Inch	Millimeter	Fraction	Inch	Millimeter				
1/32	.031	.08		.157	4.00		.354	9.00				
	.039	1.00		.237	6.00		.394	10.00				
	.046	1.17	1/4	.250	6.35		.433	11.00				
	.079	2.00		.276	7.00	15/32	.469	11.90				
	.100	2.54		.280	7.10		.472	12.00				
	.118	3.00		.315	8.00	1/2	.500	12.70				
	.150	3.81		.350	8.89							

### **OPERATING FORCE**

1 kilogram = 35.7 ounces

1 gram = .03527 ounces

1 Newton = 101.9716 grams

1,000 grams = 9.80665 Newtons

### **PLATING THICKNESS**

1 micron = 1 thousandth of 1 millimeter

1 micron ÷ .0254 = 39.37 millionths of an inch

Example: 3 microns ÷ .0254 = 118.11 millionths of an inch

### METRIC TO ENGLISH CONVERSIONS FOR MOUNTING TORQUE

Kilogram/Centimeter to Foot/Pound

1 kg/cm X .01 = .01 kg/m.01 kg/m X 7.233 = .0723 ft/lbs Kilogram/Centimeter to Inch/Pound 1 kg/cm X 2.2046 X .3937 = .867951 in/lbs

Gram/Centimeter to Ounce/Inch 1 g/cm + 2.54 + 28.4 = .0138 oz/in

100	METRIC SYSTEM TERMS								
Symbol	Prefix	Meaning	Quantity						
μ	micro	one millionth	.000001 or 10 <sup>-6</sup>						
m	milli	one thousandth	.000001 or 10 <sup>-6</sup> .001 or 10 <sup>-3</sup>						
С	centi	one hundredth	.01 or 10 <sup>-2</sup>						
d	deci	one tenth	.1 or 10 <sup>-1</sup>						
da	deca	ten	10.0 or 10						
h	hecto	one hundred	100.0 or 10 <sup>2</sup>						
k	kilo	one thousand	1,000.0 or 10 <sup>3</sup>						
M	mega	one million	1,000,000.0 or 10 <sup>6</sup>						
G	giga	one billion	,000,000,000.0 or 10 <sup>9</sup>						

# CANDLEPOWER

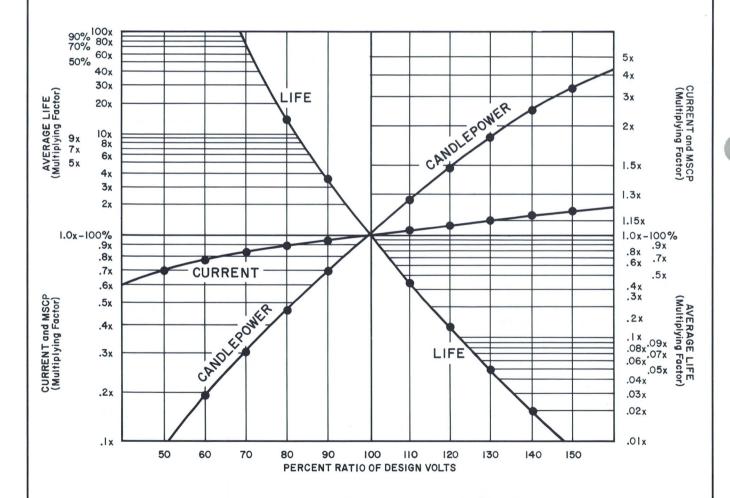
MSCP X  $4\pi$  = lumens

 $4\pi$  is approximately 12.6

### **RERATING LAMPS**

When a lamp is to be operated at a voltage other than the rated or design voltage, the rerated lamp specifications should be calculated to determine suitability for the user's application. The following formulas assist in predicting the rerated effect on luminous intensity, endurance and current. Results are most reliable for applied voltages close to the rated voltage.

For your convenience, the graph below illustrates the way current, candlepower and life performance vary with percent changes in applied voltage. The graphed values are typical for miniature and subminiature lamps with the average life based on rated voltages at 60 cycles AC, in room temperature, and under static conditions.

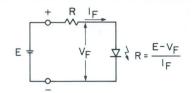


Source: <u>General Instrument Chicago Miniature Brand Incandescent and Neon Lamps</u>, Catalog No. 8400-Rev 1, (Chicago, Illinois: General Instrument Corporation), p. 3.

# **NKK®** LAMP SPECIFICATIONS

### **USE OF BALLAST RESISTOR**

If the source voltage is greater than the rated voltage of a lamp or LED, a ballast resistor must be connected in series with the lamp. The following circuit diagram and formula will assist in calculating the value of the required ballast resistor.



### Where:

R = Resistor Value (Ohms)

E = Source Voltage (V)

V<sub>F</sub> = Forward Voltage (V)

I<sub>F</sub> = Forward Current (mA)

	110	W 1/4 1/2	6 Ω 180	W	9'	V	12		SOUF	CE Y	_	AGE								
	Ω 130 110 82	W 1/4	Ω	W		V	12				-									
	130 110 82	1/4	10000	10.5	Ω			2V	14	V	16	V	18V	,	22	V	24\	<b>V</b>	28\	V
	110 82	********	180	4		W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W
	82	1/2	200000000000000000000000000000000000000	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
			150	1/2	240	1	360	1	430	1	470	2	560	2	680	2	750	2	910	3
	200	1/2	110	1/2	180	1	270	1	300	2	360	2	430	2	510	3	560	3	680	3
		1/4	270	1/4	470	1/2	620	1/2	750	1/2	910	1	1.0K	1	1.3K	1	1.5K	1	1.8K	2
-	390	1/8	510	1/8	910	1/4	1.2K	1/4	1.5K	1/2	1.8K	1/2	2.0K	1	2.4K	1/2	2.7K	1/2	3.3K	1
T	220	1/8	270	1/4	470	1/2	680	1/2	820	1/2	910	1	1.1K	1	1.3K	1	1.5K	1	1.8K	2
	200	1/4	270	1/4	470	1/2	620	1/2	750	1/2	910	1	1.0K	1	1.3K	1	1.5K	1	1.6K	2
	200	1/4	270	1/4	470	1/2	680	1/2	820	1/2	910	1	1.1K	1	1.3K	í	1.5K	1	1.8K	1
	200	1/4	220	1/4	430	1/2	620	1/2	750	1	910	1	1.0K	1	1.2K	1	1.3K	1	1.6K	2
	130	1/4	160	1/2	300	1	430	1	510	1	560	1	680	2	820	2	910	2	1.0K	2
	150	1/4	200	1/4	360	1/2	510	1	620	1	750	1	820	1	1.0K	2	1.1K	2	1.3K	2
	120	1/4	160	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
	120	1/4	160	1/2	270	1/2	390	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
	120	1/4	160	1/2	300	1	430	1	510	1	560	1	680	2	820	2	910	2	1.0K	2
	120	1/4	160	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
	180	1/4	240	1/4	430	1/2	620	1/2	750	1	910	1	1K	1	1.2K	1	1.3K		1.6K	2
	200	1/4	270	1/4	470	1/2	680	1/2	820	1	910	1	1.1K	1	1.3K	1	1.5K	1	1.8K	1
	150	1/4	200	1/4	360	1/2	510	1	620	1	560	1	820	1	1.0K	2	1.1K	2	1.3K	2
	120	1/4	160	1/2	270	1/2	390	1	470	1	560	1	620	2	820	2	910	2	1.1K	2
	100	1/4	130	1/2	240	1	330	1	390	1	470	2	510	2	680	2	750	2	910	2
	68	1/2	91	1/2	150	1	220	2	270	2	300	2	360	2	430	3	510	3	560	4
	180	1/4	240	1/4	430	1/2	620	1/2	750	1	910	1	1K	1	1.2K	1	1.3K	1	1.6K	2
	180	1/4	240	1/4	430	1/2	620	1/2	750	1	910	1	1K	1	1.2K	1	1.3K	1	1.6K	2
888 B			200				510	1	620	1	680	1	820	1				******	1.3K	2
	91	1/2	130	1/2	220	1		1	390	1	470	2	510	2	******************	2		2	820	3
						1		1		2		2								3
			*************			1/2	*************	1/2		1		1		*******			*************	**********	**************	2
	***********							1	470	1	***********	1				2		2	500000000000000000000000000000000000000	2
		*******					***********	1	330	1	390	1	470	******	************	**********				2
	27	1/4	62					1	330	1	390	1	************	80000000	800000000000000000000000000000000000000			***********	***************************************	2
		68 110 91 36 27	68 1/2 110 1/4 91 1/4 36 1/4 27 1/4	68 1/2 91 110 1/4 160 91 1/4 130 36 1/4 75 27 1/4 62	68 1/2 91 1/2 110 1/4 160 1/4 91 1/4 130 1/4 36 1/4 75 1/4 27 1/4 62 1/4	110 1/4 160 1/4 330 91 1/4 130 1/4 240 36 1/4 75 1/4 180 27 1/4 62 1/4 160	68 1/2 91 1/2 160 1 110 1/4 160 1/4 330 1/2 91 1/4 130 1/4 240 1/2 36 1/4 75 1/4 180 1/2 27 1/4 62 1/4 160 1/2	68     1/2     91     1/2     160     1     240       110     1/4     160     1/4     330     1/2     470       91     1/4     130     1/4     240     1/2     390       36     1/4     75     1/4     180     1/2     270       27     1/4     62     1/4     160     1/2     270	68     1/2     91     1/2     160     1     240     1       110     1/4     160     1/4     330     1/2     470     1/2       91     1/4     130     1/4     240     1/2     390     1       36     1/4     75     1/4     180     1/2     270     1       27     1/4     62     1/4     160     1/2     270     1	68     1/2     91     1/2     160     1     240     1     300       110     1/4     160     1/4     330     1/2     470     1/2     560       91     1/4     130     1/4     240     1/2     390     1     470       36     1/4     75     1/4     180     1/2     270     1     330       27     1/4     62     1/4     160     1/2     270     1     330	68     1/2     91     1/2     160     1     240     1     300     2       110     1/4     160     1/4     330     1/2     470     1/2     560     1       91     1/4     130     1/4     240     1/2     390     1     470     1       36     1/4     75     1/4     180     1/2     270     1     330     1       27     1/4     62     1/4     160     1/2     270     1     330     1	68     1/2     91     1/2     160     1     240     1     300     2     330       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680       91     1/4     130     1/4     240     1/2     390     1     470     1     560       36     1/4     75     1/4     180     1/2     270     1     330     1     390       27     1/4     62     1/4     160     1/2     270     1     330     1     390	68     1/2     91     1/2     160     1     240     1     300     2     330     2       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1       27     1/4     62     1/4     160     1/2     270     1     330     1     390     1	68     1/2     91     1/2     160     1     240     1     300     2     330     2     390       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1     750       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1     620       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1     470       27     1/4     62     1/4     160     1/2     270     1     330     1     390     1     470	68     1/2     91     1/2     160     1     240     1     300     2     330     2     390     2       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1     750     1       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1     620     1       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1     470     2       27     1/4     62     1/4     160     1/2     270     1     330     1     390     1     470     2	68     1/2     91     1/2     160     1     240     1     300     2     330     2     390     2     510       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1     750     1     1.0K       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1     620     1     750       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1     470     2     620       27     1/4     62     1/4     160     1/2     270     1     330     1     390     1     470     2     620	68     1/2     91     1/2     160     1     240     1     300     2     330     2     390     2     510     3       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1     750     1     1.0K     1       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1     620     1     750     2       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1     470     2     620     2	68     1/2     91     1/2     160     1     240     1     300     2     330     2     390     2     510     3     560       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1     750     1     1.0K     1     1.1K       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1     620     1     750     2     820       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1     470     2     620     2     680       27     1/4     62     1/4     160     1/2     270     1     330     1     390     1     470     2     620     2     680	68       1/2       91       1/2       160       1       240       1       300       2       330       2       390       2       510       3       560       3         110       1/4       160       1/4       330       1/2       470       1/2       560       1       680       1       750       1       1.0K       1       1.1K       2         91       1/4       130       1/4       240       1/2       390       1       470       1       560       1       620       1       750       2       820       2         36       1/4       75       1/4       180       1/2       270       1       330       1       390       1       470       2       620       2       680       2         27       1/4       62       1/4       160       1/2       270       1       330       1       390       1       470       2       620       2       680       2	68     1/2     91     1/2     160     1     240     1     300     2     330     2     390     2     510     3     560     3     620       110     1/4     160     1/4     330     1/2     470     1/2     560     1     680     1     750     1     1.0K     1     1.1K     2     1.3K       91     1/4     130     1/4     240     1/2     390     1     470     1     560     1     620     1     750     2     820     2     1.0K       36     1/4     75     1/4     180     1/2     270     1     330     1     390     1     470     2     620     2     680     2     820       27     1/4     62     1/4     160     1/2     270     1     330     1     390     1     470     2     620     2     680     2     820

The electrical specifications shown in the following tables are determined at a basic temperature of 25°C. Lamp circuits are independent of switch operation, except in the M2100 switches.

Neon

### Ballast resistor information is given on the previous page.

	Single E	lement LEI Bezel	)
Colors		Red	Green
Forward Peak Current	I <sub>EM</sub>	25mA	30mA
Continu's Fwd Current	Ĩ,	20mA	20mA
Forward Voltage	V <sub>E</sub>	2.8V	2.2V
Reverse Peak Voltage	V <sub>BM</sub>	4V	4V
Current Reduction Rate	ΔÏ	0.33	0.40
Above 25°C		mA/°C	mA/°C
Ambient Temp Range		-10°C ~	-25°C ~
		+70°C	+85°C

### AT602 Incandescent & AT602N Neon for MLW & LW Series

Voltage	V	6V	12V	18V	24V	28V	110V
Current	1	80mA	50mA	35mA	25mA	22mA	1.5mA
MSCP		.159	.215	.398	.215	.247	NA
Endurance	Hours	2,000	2,000	2,000	2,000	2,000	25,000
Ambient Temp	Range			-10°C	~ +509	C	

Incandescent

Recommended Resistors for Neon: 33K ohms for 110V AC

100K ohms for 220V AC

### AT604 Incandescent & AT604N Neon for DLB Series

Voltage	V	6V	14V	28V	110V		
Current	1	200mA	80mA	40mA	1.5mA		
MSCP		.340	.500	.340	NA		
Endurance	Hours	1,000	750	1,000	10,000		
Ambient Temp Ra	inge		-10°C ~ +50°C				
Recommended Re	esistors for N	leon:		ms for 1 hms for	10V AC 220V AC		

### AT606 Single Element LED for MLW Series

		And the second second second second	TO HAVE THE BOOK OF THE PARTY O
Colors		Red	Green
Forward Peak Current	I <sub>FM</sub>	25mA	30mA
<b>Continuous Forward Current</b>	Ï,	20mA	25mA
Forward Voltage	V_	2.8V	2.8V
Reverse Peak Voltage	V <sub>RM</sub>	4V	4V
Current Reduction Rate	ΔΪΕ	0.33	0.40
Above 25°C		mA/°C	mA/°C
Ambient Temp Range		-15°C ~ +	50°C

### AT607 Incandescent & AT607N Neon for LB Series

		Inca	Neon		
Voltage	V	5V	12V	28V	110V
Current	- 1	115mA	60mA	24mA	1.5mA
MSCP		.150	.150	.150	NA
Endurance	Hours	7,000	7,000	7,000	10,000
Recommended	Resistors for	Neon:	33K of	ims for 1	10V AC
			100K c	hms for	220V AC
<b>Ambient Temp</b>	Range	-25°C ~	+ 50°C		

		AT611 Incandescent for KB & YB Series			
Voltage	V	5V	12V	28V	
Current	1	115mA	60mA	24mA	
MSCP		.150	.150	.150	
Endurance	Hours	7,000	7,000	7,000	

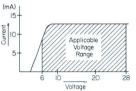
### AT612 Double Element LED for KR Series

101	VD 2	61169		
Colors	J. J.L. S	Red	Yellow	Green
Forward Peak Current	I <sub>EM</sub>	20mA	20mA	20mA
Continuous Forward Current	I,	13mA	13mA	13mA
Forward Voltage	V <sub>E</sub>	6-28V	6-28V	6-28V
Forward Peak Voltage	V <sub>FM</sub>	30V	30V	30V
Reverse Peak Voltage	VRM	30V	30V	30V
Current Variable Rate	Δİ	$V_{\rm E} = 10$	~ 24V	± 20%
Ambient Temp Range		-3	80°C ~ +5	O°C

**Built-in IC Chip** 

A built-in IC chip maintains constant current when used within a 6-28V range. Voltage surges beyond 28 volts will burn down the IC chip. The

IC chip's regulation of voltage eliminates the need for a ballast resistor and results in a low current consumption of 13mA average, as illustrated in the accompanying graph. Double elements in the LED result in brighter intensity.



### AT614 Single Element LED for KB & LB Series

Colors		Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	50mA	50mA	50mA
<b>Continuous Forward Current</b>	Ï,	40mA	40mA	40mA
Forward Voltage	V.	1.75V	2.35V	2.35V
Reverse Peak Voltage	V <sub>RM</sub>	4V	4V	4V
Current Reduction Rate	$\Delta l_{E}$	0.67	0.67	0.67
Above 25°C		mA/°C	mA/°C	mA/°C
Ambient Temp Range		-3	0°C ~ +50°	C

### AT615 Neon for KB Series

Voltage	ge V	
Current	1	1.5mA
Endurance	Hours	10,000
Decemponded	Docietore for Noon	and above

33K ohms for 110V AC Recommended Resistors for Neon: 100K ohms for 220V AC

**Ambient Temp Range** 

-25°C ~ + 50°C

### AT616 Single Element LED for HB Series

Colors		Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	30mA	20mA	30mA
Continuous Forward Current	Ϊ	24mA	16mA	24mA
Forward Voltage	V_	2.04V	1.88V	2.02V
Reverse Peak Voltage	V <sub>RM</sub>	5V	5V	5V
Current Reduction Rate	ΔĬ	0.40	0.26	0.40
Above 25°C		mA/°C	mA/°C	mA/°C
Ambient Temp Range		-2	25°C ~ +50	°C

# AT617 Single Element LED

TOT A I	212	Rezei		
Colors		Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	30mA	20mA	30mA
Continuous Forward Current	Ï,	24mA	16mA	24mA
Forward Voltage	V.	2.04V	1.88V	2.02V
Reverse Peak Voltage	V <sub>RM</sub>	5V	4V	5V
Current Reduction Rate	ΔI	0.40	0.27	0.40
Above 25°C		mA/°C	mA/°C	mA/°C
Ambient Temp Range		-1	5°C ~ +70	°C

-25°C ~ +50°C

Ambient Temp Range

AT618 Single	Element	LED	
for Spot Illuminated	LB & A	T213 B	ezel

		Single Color Bicol				
Colors		Red	Yellow	Green	Red/Green	
Forward Peak Current	I <sub>FM</sub>	10mA	20mA	30mA	50mA	
Continuous Forw'd Current	Ĭ,	8mA	16mA	24mA	25mA	
Forward Voltage	V <sub>F</sub>	1.9V	1.9V	2.0V	2.0V	
Reverse Peak Voltage	VRM	5V	4V	5V		
Current Reduction Rate	$\Delta I_{E}$	0.13	0.27	0.40	0.67	
Above 25°C		mA/°C	mA/°C	mA/°C	mA/°C	
Ambient Temp Range			-25°C ~		-25°C ~	
			+50°C		+55°C	

### AT620 Single Element LED for VR Series

1000	1169		
	Red	Yellow	Green
I <sub>EM</sub>	40mA	40mA	40mA
ΪĘ	30mA	30mA	30mA
V.	3.9V	3.9V	4.2V
V <sub>RM</sub>	8V	8V	8V
$\Delta I_{E}$	0.50	0.50	0.50
	mA/°C	mA/°C	mA/°C
		-30°C ~ +8	5°C
	I <sub>FM</sub> I <sub>F</sub> V <sub>F</sub> V <sub>RM</sub>	Red   40mA   1   30mA   V   3.9V   V   8V   ΔI   50.50   mA/°C   C   1   1   1   1   1   1   1   1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$

### AT621 Single Element LED (Bicolor Red/ Green) for YB Series

	W/O	Hesist'r	W/Bu	sistor	
LED Voltage Codes		02	05	12	24
Forward Peak Current	I <sub>EM</sub>	60mA	60mA	20mA	12mA
Continuous Forw'd Current	I,	45mA	45mA	15mA	10mA
Forward Voltage	V <sub>E</sub>	2.1V	5V	12V	24V
Reverse Peak Voltage	VRM	Not a	applicab	le to bico	olor
Current Reduction Rate	ΔIE	8.0			
Above 25°C		mA/°C			
Ambient Temp Range			-30°C	~ +60°C	

### Single Element LED for YB Series Spot Illuminated Cap

				Desired March 1988	
	W/o	Resist'r	w/Built-in Resistor		
LED Voltage Codes		02	05	12	24
Forward Peak Current	I <sub>EM</sub>	20mA	15mA	15mA	12mA
Continuous Forw'd Current	I,	15mA	12.5mA	12.5mA	10mA
Forward Voltage	V_	2.1V	5V	12V	24V
Reverse Peak Voltage	VDM	5V	5V	5V	5V
Reverse Peak V	oltage	e not app	licable to	bicolor.	
Current Reduction Rate	$\Delta I_{\epsilon}$	0.27			
Above 25°C	,	mA/°C			
Ambient Temp Range			-25°C ~	+50°C	

### Single Element LED for DI B Series

101	DED 3	el les	
Colors		Red	Green
Forward Peak Current	I <sub>EM</sub>	35mA	30mA
Continuous Forward Current	FM F	25mA	20mA
Forward Voltage	V <sub>E</sub>	1.65V	2.0V
Reverse Peak Voltage	V <sub>RM</sub>	3V	3V
Current Reduction Rate	$\Delta l_{E}$	0.57	0.43
Above 25°C		mA/°C	mA/°C
Ambient Temp Range		-10°C -	+50°C

### Single Element LED for JB & UB Series

101 01	Javi	2001103		
Colors		Red	Yellow	Green
Forward Peak Current	I <sub>EM</sub>	30mA	20mA	20mA
<b>Continuous Forward Current</b>	Ï,	20mA	15mA	15mA
Forward Voltage	V_	2.0V	1.9V	1.95V
Reverse Peak Voltage	V	5V	5V	5V
Current Reduction Rate	V <sub>RM</sub> ∆I <sub>F</sub>	0.40	0.27	0.27
Above 25°C		mA/°C	mA/°C	mA/°C
Ambient Temp Range		-2	5°C ~ +70	°C

### Single Element LED for JF Series

Colors		Red	Yellow	Green		
Forward Peak Current	I <sub>EM</sub>	40mA	40mA	40mA		
<b>Continuous Forward Current</b>	'FM   <sub>F</sub>	30mA	30mA	30mA		
Forward Voltage	V <sub>F</sub>	1.7V	2.2V	2.2V		
Reverse Peak Voltage	VRM	4V	4V	4V		
Current Reduction Rate	ΔÏF	0.67	0.67	0.67		
Above 25°C		mA/°C	mA/°C	mA/°C		
Ambient Temp Range		-25°C ~ +70°C				

### Single Element LED for M2100 Toggles & Rockers

	99.00 0			PACSA TELESCOPE		
	Red	Yellow	Green	Bicolor		
l <sub>EM</sub>	25mA	30mA	30mA	25mA		
Ï,	20mA	20mA	20mA	20mA		
V.	2.1V	2.1V	2.1V	2.1V		
V	4V	4V	4V			
ΔĬ	0.33	0.40	0.40	0.33		
-	mA/°C	mA/°C	mA/°C	mA/°C		
	-10°C ~ +55°C					
	V <sub>F</sub>	$\begin{array}{cccc} I_{FM} & 25 mA \\ I_{F} & 20 mA \\ V_{F} & 2.1 V \\ V_{RM} & 4 V \\ \Delta I_{F} & 0.33 \\ & mA/^{\circ}C \end{array}$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		

### Single Element LED for M2100 Paddles

Colors		Red	Yellow	Green	Bicolor
Forward Peak Current	I <sub>FM</sub>	10mA	20mA	30mA	50mA
Continuous Forw'd Current	Ĭ,	8mA	16mA	24mA	25mA
Forward Voltage	V.	1.9V	1.9V	2.0V	2.1V
Reverse Peak Voltage	VRM	5V	4V	5V	
Current Reduction Rate	ΔΪΕ	0.13	0.27	0.40	0.67
Above 25°C		mA/°C	mA/°C	mA/°C	mA/°C
Ambient Temp Range		-	25°C ~ +	70°C	

### Single Element LED for MS & SS Series

Colors		Red	Yellow	Green
Forward Peak Current	I <sub>FM</sub>	20mA	20mA	20mA
Continuous Forw'd Current	Ĭ,	16mA	16mA	16mA
Forward Voltage	V <sub>E</sub>	2.07V	2.15V	2.16V
Reverse Peak Voltage	V	3V	4V	4V
Current Reduction Rate	V <sub>RM</sub> ΔΙ <sub>E</sub>	0.27	0.27	0.27
Above 25°C		mA/°C	mA/°C	mA/°C
Ambient Temp Range		-1	5°C ~ +70	°C

### **FACTORS FOR CALCULATING RERATED CURRENT AT VARIOUS LOADS** Original Resistive Inductive Lamp Motor Rated Load Load Load Load Load 125V AC 1.0 0.66 0.25 0.33 250V AC 0.66 0.33 0.16 0.22 **12V DC** 1.25 1.0 0.31 0.41 **30V DC** 1.0 0.5 0.25 0.33 **48V DC** 0.33 0.25 0.08 0.11

Sample Calculation: A switch with a resistive rating of 6A @ 125V AC could be used with an inductive rating of 3 - 4A (6 X 1/2 = 3 and 6 X 2/3 = 4).

0.03

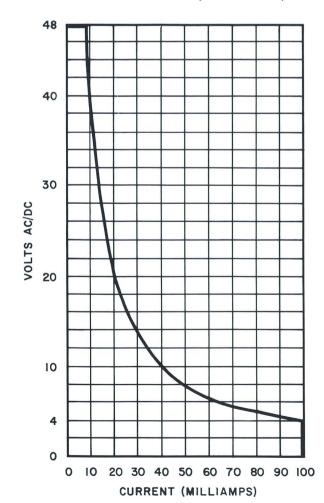
Rerated values are general & should allow optimum life, dependent upon application. They are not guaranteed values.

### **OPERATING RANGE (APPLICATION DEPENDENT)**

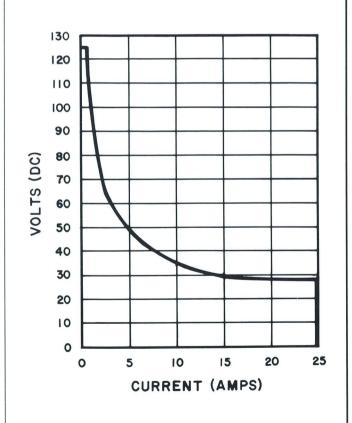


0.05

125V DC



# DC CAPACITY SERIES S300 RATED 15A @ 125V AC RESISTIVE LOAD





ABS Acrylonitrile Butadiene Styrene; a thermoplastic composed of styrene and acrylic resin which provides shatterproofing and a shiny appearance; it is resilient and can be easily metal plated.

AC Alternating Current; electric current that continually reverses direction at a fixed frequency.

a metal created by combining two or more different metals to obtain a desired physical property. alloy

alternate action commonly describing pushbutton switches; remaining in a given circuit condition after removal of

actuating force; when actuating force is applied a second time, the opposite circuit is engaged; also known as push-push switching action; may or may not be latchdown.

ambient temperature

**DKK**®

range

operating temperature range.

angle of throw used with rockers and toggles to indicate total travel arc measured in degrees.

annealed relieved of mechanical stress through the application of heat and gradual cooling; for example,

annealed copper is less brittle.

**ANSI** American National Standards Institute; a standard-setting agency of the United States which

approves the design and/or performance of electrical/electronic components that are distributed

in the world market.

arcing the flow of electric current between opening or closing switch contacts.

bifurcated contact a two-pronged, wiping movable contact.

bounce the repeated rebounding of the movable contact during the transfer from one throw to the next:

measured in milliseconds.

brass an alloy of zinc and copper.

break before make interrupting one circuit of a pole before completing another of the same pole (nonshorting contact).

capacitive load a load in which the initial current on make is higher than steady state; upon break it is less than

steady state. Current leads voltage in capacitive loads.

clad the joining of two dissimilar materials by welding or bonding.

contact resistance the resistance across a pair of closed contacts which is in series with the load; this resistance

increases with the age of the switch at a rate varied by environment, frequence of use, voltage,

and load conditions; measured in milliohms.

creepage the unwanted flow of electrical current from one conductive part to another.

CSA Canadian Standards Association.

cycle the complete sequence of indexing through all successive switch positions and returning to the

original position.



~ ~ ~ D ~ ~ ~

DC Direct Current; electric current that flows only in one direction.

detent a mechanical positioning device for stopping actuator travel at each successive electrical circuit;

for example, a spring-operated ball and groove.

dielectric strength the ability of an insulating material to withstand high voltage without electrical degradation.

differential travel the distance an actuator moves between the point where contacts snap over and where they snap

back, or where a contact makes and then breaks.

DIP Dual Inline Package, indicating .100" center-to-center terminal spacing and .300" row-to-row

spacing.

double break having two pairs of contacts (shorting bar) that open the circuit at two places; having this added

contact material improves heat dissipation and increases life; desirable in DC circuit applications.

**DP** Double Pole; see pole.

dry circuit a low energy circuit condition where no arcing occurs during contact switching; for example

0.4VA maximum @ 28V AC/DC maximum; see logic level.

DSP National Defense Standards of Japan; NKK file numbers C 6310B & C 6313.

Double Throw; see throw.

~ ~ ~ F ~ ~ ~

flash plating a very thin or "instant plating" of usually less than 10 microinches in thickness.

flux chemical used for cleaning metal surfaces so that solder will flow out on the metal; fluxes change

a passive, contaminated metal surface into an active, clean, solderable surface.

~ ~ ~ G ~ ~ ~

gull wing a type of surface mount terminal which extends from the side of the switch and has an L-shaped

bend at the end.

~ ~ ~ | ~ ~ ~

inductive load a load in which the initial current on make is lower than steady state and upon break is

greater than steady state. The long arcing time, due to stored energy in the inductor at

the time of breaking, is severe on the switch contacts.

IEC International Electrotechnical Commission

3 Rue de Varembe P. O. Box 131

1211 Geneva 20, Switzerland

IEC's Quality Assessment System for Electronic Components, created in 1983 to facilitate

national and international trade in certified electronic components; a worldwide certification system which provides a method whereby electronic components made and handled by approved manufacturers and distributors can be used anywhere without further testing.

infrared reflow a method of mass soldering surface mount devices with some form of infrared (IR) thermal

radiation, such as a lamp IR system where PCB and components are heated largely by

radiant energy from IR lamps.

CI	Acc	ADV	OF .	TEDA	10 0	ACD	ONYMS
GL		AFIT	UF	LERN	13 6	AUH	DAIMS

inrush the initial, transitory high-level of current through contacts upon making (closing); can cause

severe degradation of contacts; applicable to resistive and capacitive loads.

IP part of the IEC529 standard recommending the degree of protection of enclosures for low-

voltage switch gear; specifically, concerned with protection of persons against contact with live or moving parts and the prevention of ingress of solid foreign bodies and liquid; an industrial

specification used internationally and similar to NEMA.

insulation resistance the electrical resistance between two normally insulated parts; measured at a specific high

potential; usually greater than 1 megohm.

**Isolated lamp circuit** independent of switching circuit; lamp is operated on a circuit separate from the switch circuit.

JETL Japan Electrical Testing Laboratory.

The Electrical Testing Laboratory.

JIS Japan Industrial Standard; Japan Industrial Standards Committee (JISC)

Agency of Industrial Science and Technology.

~ ~ ~ L ~ ~ ~

lamp load (tungsten) most notably characterized by the high inrush current at make (approximately 10 to 16 times the

steady state).

latchdown one type of alternate action in which the pushbutton is mechanically fastened in the down

position; the pushbutton is at "normal" position for one circuit and latched down position for the

other circuit condition.

LED Light Emitting Diode; provides illumination with advantages of long life and low power

consumption.

logic level an application in which power levels do not cause arcing, melting, or softening of contacts; also

referred to as dry circuit or low energy; specificied 0.4VA max @ 28V AC/DC max; typically

requiring gold contacts for reliability.

~ ~ ~ M ~ ~ ~

maintained action remaining in a given circuit condition until actuated to the opposite circuit condition where it is

again maintained; opposite momentary action.

make before break completing one circuit of a pole before interrupting another of the same pole (shorting contact).

MITI Ministry of Industry & Trade Institute (Japan).

momentary action mechanically returning from a temporary circuit condition to the normal circuit condition as soon

as the actuating force is removed.

MSCP Mean Spherical Candle Power; a unit of measure of light intensity.

~ ~ ~ N ~ ~ ~

NBR Nitrile Butadiene Rubber, a copolymerization of nitrile and butadiene which is used

mainly to meet oilproof requirements of o-rings and switch boots or covers.

NC Normally Closed contacts; circuit is closed when actuator is in relaxed or normal position.



NEMA National Electrical Manufacturers Association, an agency of the United States setting standards

for products distributed worldwide; applied to switches in their degrees of protection against the

intrusion of liquids, dust, and other contaminants.

Newton the unit of measure for operating force abbreviated N; see the conversion tables in the

previous subsection.

NO Normally Open contacts; circuit is open when actuator is in relaxed or normal position; applies to

momentary or alternate action switches.

**nominal** the result of the calculated actual value range.

nonshorting contacts contacts which break before make; usually much higher than the switching rating.

nonswitching rating the power carrying capability of a switch after contact closure and at the end of contact bounce.

~ ~ ~ 0 ~ ~ ~

opaque condition that prevents the passage of light.

**overtravel** the distance an actuator moves beyond the point at which electrical contacts transfer.

~ ~ ~ P ~ ~ ~

panel seal liquid is prevented from reaching the switch contacts from the front of the panel if the panel is

subjected to spills or splashing.

PBT polybutylene terephthalate, a polyester thermoplastic resin compound.

PCB Printed Circuit Board; thin copper traces on a plastic laminate providing low cost, low current

mass wiring.

PF Power Factor; a means of determining contact capability when used with inductive loads relative

to the standard resistive load rating; for example, if PF = 1.0 the inductive load is 100% of the

resistive load, or if PF = 0.6 the inductive load is 60% of the resistive load.

pole a single common electrical input having one or more outputs.

2 (COMM) • 3 1 2 3 4 5 6 7 8 9 10 11 12

2 (COMM) 5 • 3 • 1 6 • •

Single Pole (w/1 output)

Single Pole (w/12 outputs)

Double Pole (w/2 outputs)

**position** the mechanical detents of a switch actuator.

PPS polyphenylene sulfide; a thermoplastic resin which is chemical and flame resistant.

pretravel the distance an actuator moves before a change in the electrical condition is made.

push-push also known as alternate action; is not latchdown.

~ ~ R ~ ~ ·

RCJ Reliability Center for Electronic Components of Japan,

member of EXACT (International Exchange of Authenticated

Electronic Component Performance Test Data).

resistive load the easiest load to switch because current and voltage are in a steady state on make and drop

instantly to zero on break; produces minimal arcing which maximizes contact life.

RMS Root Mean Square.

SEV

lamp circuit

~ ~ ~ S ~ ~ ~

SEMKO Svenska Elektriska Materielkontrollanstalten of Sweden.

Schweizerischer Elektrotechnischer Verein of Switzerland.

**shorting contacts** contacts which make before break.

silicone rubber rubber made from silicone elastomers and noted for its retention of flexibility, resilience, and tensile

strength over a wide temperature range.

SIP Single Inline Package, indicating .100" center-to-center terminal spacing with terminals aligned in

one row.

snap action the abrupt transfer of contacts from one position to another; this action is relatively independent

of the speed of actuator travel.

SPST Single Pole Single Throw; see pole, also throw.

STC Sliding Twin Contact, an NKK-patented mechanism with two movable contact surfaces which

pinch the stationary contacts.

surface mount component terminals are soldered to pads on the surface of the PC boards as opposed to using

holes for mounting; terminal shapes vary -- gull wing, J-bend, and others.

synchronous lamp is operated on a circuit in phase with the switch; the switch contains a separate circuit to

open or close the lamp circuit simultaneously with the switching circuit.

•

tactile feedback the switching action felt by an operator.

thermal shock the state of a component that is undergoing an excessive temperature change, particularly in

reference to movement from one process to another in soldering and cleaning.

throw the number of electrical circuits within a pole.

Single Throw (w/2 poles) Double Throw (w/1 pole)

Three Throw (w/4 poles)

sum of pretravel and overtravel; full distance an actuator moves from relaxed position past the total travel

point of electrical contact and to the end of travel.

transmitting and diffusing light so that objects beyond cannot be seen clearly. translucent

transmitting light without appreciably scattering so that objects lying beyond are entirely visible. transparent

the distance the actuator moves to effect the change of electrical circuits; see also differential travel

travel, pretravel, overtravel, and total travel.

Overtravel Total Overtravel Positions of Plunger

two circuit circuit in which one circuit is completed in one position and

another separate circuit is completed in the other position.

UL Underwriters Laboratories Inc.; many of NKK's switches are UL Recognized.

> a coating used for preparation of a surface for plating or used to prevent corrosion when the finish plating develops pinholes; thickness of an undercoating is determined by its purpose.

a process well-suited to soldering surface mount devices; it combines infrared preheating with vapor phase

condensation heating for reflow, advantageous for eliminating overheating of components

and PCB.

**VDE** Verband Deutscher Elektrotechniker of West Germany.

capable of being subjected to automated washing procedures after wave soldering without washable

diminishing electrical or mechanical life specifications; see "Washability Data" in the Supplement; other terms such as process compatible, totally sealed, and immersible are

sometimes used to describe washability.

wave soldering a method of soldering in which a wave of molten solder contacts surfaces as the PC board with

components is conveyed through the process; wave width, travel speed, dwell time, etc. are

varied to achieve desired results.

wiping action sliding of contacts over one another resulting in cleaning of the surfaces.

### **ELEMENTS**

Ag silver Cr chromium Sn tin AI aluminum Cu SnPb tin lead copper Au gold Ni nickel Zn zinc

### **FEDERAL SUPPLY CODE NUMBER**

NKK Switches has been assigned the FSC Number 63426 & is classified as a Commercial And Governmental Entity (CAGE) by the Defense Logistics Agency in Battle Creek, Michigan.

undercoating

Z35

# **DKK** INDEX BY MODEL NUMBER

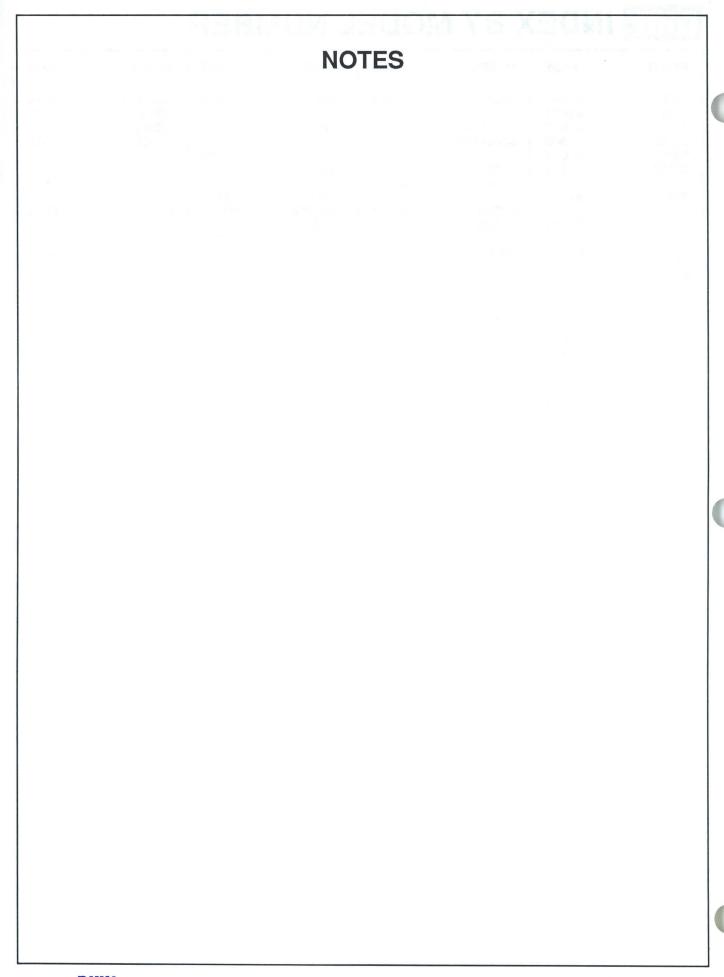
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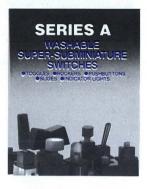
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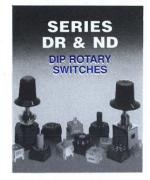
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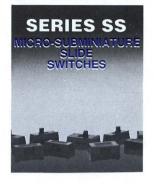
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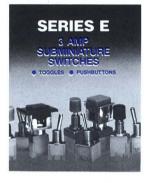
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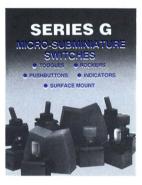
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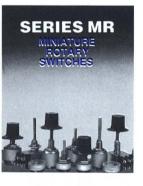
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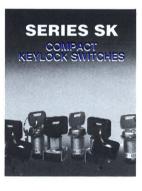
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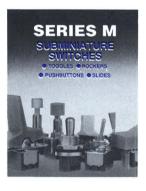
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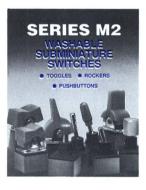
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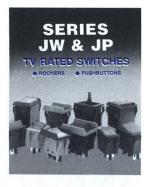
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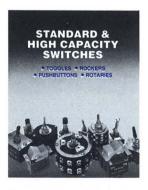
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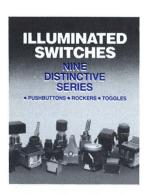
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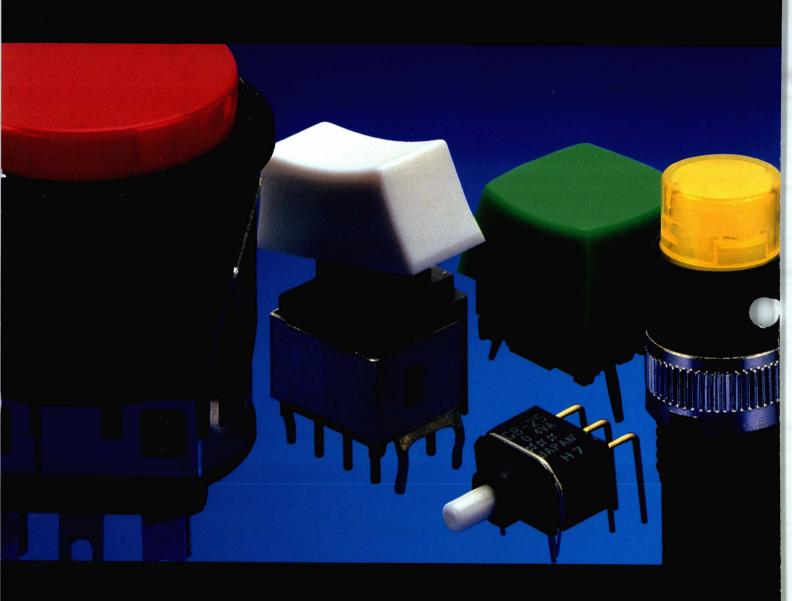
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